JVC

SERVICE MANUAL

COLOR VIDEO CASSETTE RECORDER

HR-D150U/HR-D151U

SPECIFICATIONS

Format		: VHS standard
Recording system		: Rotary, slant azimuth two-head helical scan system with two pairs of video heads, one pair exclusively for the SP mode and one pair for the EP mode.
Video signal system		: NTSC-type color signal
Tape width		: 12.65 mm (1/2 inch)
Tape speed	(SP)	: 33.35 mm/s (1-5/16 ips)
	(EP)	: 11.12 mm/s (7/16 ips)
Maximum recording time	(SP)	: 160 min. with JVC T-160 video cassette
	(EP)	: 480 min. with JVC T-160 video cassette
Temperature		
Operating		: 5°C to 40°C (41°F to 104°F)
Storage		: -20°C to 60°C (-4°F to 140°F)
Antenna	(VHF)	: 75 ohms, unbalanced
	(UHF)	: 300 ohms, balanced
Channel coverage		
	(VHF)	: Channels VL 2 – 6 VH A – I 7 – 13 J – W
	(UHF)	: Channels 14 – 83
VHF output signal		: Channel 3 or 4 (switchable; preset to channel 3 when shipped) 75 ohms, unbalanced
Power consumption		: 28 watts
Power requirement		: AC 120 V~, 60 Hz

Video

Input	: 0.5 to 2.0 Vp-p, 75 ohms, unbalanced
Output	: 1.0 Vp-p, 75 ohms, unbalanced
Signal-to-noise ratio	: 45 dB (Rohde & Schwarz noise meter) with PICTURE SHARPNESS control at center position
Horizontal resolution	: 240 lines with PICTURE SHARPNESS control at center position

Audio

Input	: Line: -8 dBs 50 k-ohms, unbalanced
Output level	: -6 dBs, high impedance load
Output impedance	: Less than 1 k-ohm, unbalanced
Signal-to-noise ratio	: More than 40 dB
Frequency range	: 70 Hz to 10,000 Hz
Timer	: 14-day/4-event timer
Dimensions	: 435 mm(W) x 105 mm(H) x 376 mm(D) (386 mm with control panel attached) (17-3/16" x 4-3/16" x 14-13/16") (15-1/4" with control panel attached)
Weight	: 7.6 kg (16.8 lbs)
Provided accessories	: Infrared remote control unit (detachable control panel) "AAA" battery x 2 Channel number film Antenna cable (F-type) Matching transformer Screwdriver for band selector

Specifications shown are for SP mode unless otherwise specified.
Design and specifications subject to change without notice.

No. 8381
December 1984

TABLE OF CONTENTS

Section	Title	Page
	Important Safety Precautions	
	INSTRUCTIONS	
1.	**GENERAL DESCRIPTION**	
1.1	MAIN FEATURES	1-1
1.2	MECHANISM CONTROL OPERATIONS	1-1
1.2.1	Mechacon operations	1-1
1.3	DISPLAY/TIMER SECTION	1-3
1.4	GRAPHIC INDICATIONS	1-6
2.	**MECHANICAL ADJUSTMENTS**	
2.1	GENERAL	2-1
2.1.1	Precautions	2-1
2.1.2	Required jigs and tools	2-1
2.1.3	Disassembly	2-2
2.2	PERIODIC MAINTENANCE	2-4
2.2.1	Layout of maintenance parts	2-4
2.2.2	Service schedule for main components	2-6
2.3	MAIN ASSEMBLY REPLACEMENT	2-7
2.3.1	Cassette housing	2-7
2.3.2	Upper drum	2-7
2.3.3	Full erase head	2-8
2.3.4	Audio/control head	2-9
2.3.5	Pinch roller	2-9
2.3.6	Capstan motor	2-9
2.3.7	Mode control motor	2-10
2.3.8	Cassette motor	2-10
2.3.9	Reel disks	2-10
2.3.10	Clutch mechanism	2-11
2.3.11	Brush	2-12
2.3.12	Tension band	2-12
2.3.13	Pick-up head	2-12
2.4	CHECKS AND ADJUSTMENTS	2-13
2.4.1	Mechanism timing check	2-13
2.4.2	Tension pole position check	2-13
2.4.3	Take-up torque check	2-13
2.4.4	Back tension check	2-13
2.4.5	Tape transport system checks and adjustments	2-14
2.4.6	Interchangeability checks and adjustments	2-15
3.	**ELECTRICAL ADJUSTMENTS**	
3.1	PREPARATION	3-1
3.1.1	Required test equipment	3-1
3.1.2	Alignment tape contents	3-2
3.1.3	Check and adjustment steps	3-3
3.2	REGULATOR CIRCUIT (POWER SUPPLY board)	3-4
3.3	SERVO CIRCUIT (MAIN board)	3-4
3.4	VIDEO CIRCUIT (MAIN board)	3-6
3.5	AUDIO CIRCUIT (MAIN board)	3-8
3.6	TUNER/IF CIRCUIT (TU/IF board)	3-9
4.	**CHARTS AND DIAGRAMS**	
4.1	CIRCUIT BOARD LOCATIONS	4-1
4.1.1	Connections	4-2
4.1.2	Indications	4-2
4.1.3	Digital transistor	4-2
4.1.4	Chip transistor	4-2
4.1.5	Chip diode	4-2
4.1.6	Signal flow in the schematic	4-2
4.2	KEY TO ABBREVIATIONS	4-3
4.3	AUDIO BLOCK DIAGRAM	4-5
4.4	MECHANISM CONTROL BLOCK DIAGRAM	4-6
4.5	MECHANISM CONTROL TIMING CHARTS	4-7
4.6	SERVO BLOCK DIAGRAM	4-8
4.7	SERVO TIMING CHARTS	4-9
4.8	TUNER/IF BLOCK DIAGRAM	4-10
4.9	VIDEO (Y) BLOCK DIAGRAM	4-11
4.10	VIDEO (COLOR) BLOCK DIAGRAM	4-12
4.11	TIMER DISPLAY/PRESETTER BLOCK DIAGRAMS	4-13
4.12	MECHANISM CONTROL SCHEMATIC DIAGRAM	4-14
4.13	MAIN (MECHACON) CIRCUIT BOARD	4-15
4.14	AUDIO SCHEMATIC DIAGRAM	4-16
4.15	MAIN (AUDIO) CIRCUIT BOARD	4-17
4.16	SERVO SCHEMATIC DIAGRAM	4-18
4.17	MAIN (SERVO) CIRCUIT BOARD	4-19
4.18	VIDEO SCHEMATIC DIAGRAM	4-20
4.19	MAIN (VIDEO) CIRCUIT BOARD	4-21
4.20	PRESETTER SCHEMATIC DIAGRAM (HR-D150U/UC)	4-22
4.21	PRESETTER CIRCUIT BOARD (HR-D150U/UC)	4-23
4.22	PRESETTER SCHEMATIC DIAGRAM (HR-D151U/UC)	4-24
4.23	PRESETTER CIRCUIT BOARD (HR-D151U/UC)	4-25
4.24	TIMER/DISPLAY SCHEMATIC DIAGRAM (HR-D150U/UC)	4-26

Section	Title	Page
4.25	TIMER/DISPLAY CIRCUIT BOARD (HR-D150U/UC)	4-27
4.26	TIMER/DISPLAY SCHEMATIC DIAGRAM (HR-D151U/UC)	4-28
4.27	TIMER/DISPLAY CIRCUIT BOARD	4-29
4.28	TUNER/IF SCHEMATIC DIAGRAM	4-30
4.29	TUNER/IF CIRCUIT BOARD	4-31
4.30	POWER SUPPLY SCHEMATIC DIAGRAM	4-32
4.31	POWER SUPPLY CIRCUIT BOARD	4-33
4.32	DRUM MDA, DRUM FG AND DRUM MOTOR SCHEMATIC DIAGRAMS	4-34
4.33	DRUM MDA, DRUM FG AND DRUM MOTOR CIRCUIT BOARDS	4-35
4.34	REMOCON, FRONT SWITCH AND INFRARED SCHEMATIC DIAGRAMS	4-36
4.35	REMOCON, FRONT SWITCH AND INFRARED CIRCUIT BOARDS	4-37
4.36	RF SWITCH AND RF MODULATOR SCHEMATIC DIAGRAM	4-38
4.37	OVERALL WIRING	4-39

5. EXPLODED VIEWS AND PARTS LIST

5.1	STANDARD PART NUMBER CODING	5-2
5.1.1	Screw coding	5-2
5.2	EXPLODED VIEWS AND PARTS LIST	5-3
5.2.1	Packing assembly [M1]	5-3
5.2.2	Cabinet assembly [M2]	5-4
5.2.3	Chassis assembly [M3]	5-6
5.2.4	Mechanism assembly [M4]	5-8
5.2.5	Cassette housing assembly [M5]	5-10

6. ELECTRICAL PARTS LIST

6.1	STANDARD PART NUMBER CODING	6-2
6.1.1	Fixed resistor coding	6-2
6.1.2	Fixed capacitor coding	6-3
6.1.3	Fuse coding	6-5
6.2	ELECTRIC PARTS LIST BY ASSEMBLY	6-6
6.2.1	Power supply board ass'y	6-6
6.2.2	A/V/S/M (Main) board ass'y	6-7
6.2.3	Tuner/IF board ass'y	6-14
6.2.4	Timer/Display board ass'y	6-16
6.2.5	Presetter board ass'y	6-17
6.2.6	Front switch board ass'y	6-18
6.2.7	Head/MDA board ass'y	6-19
6.2.8	RF switch & RF modulator board	6-19
6.2.9	Audio/Control head board	6-19
6.2.10	End sensor board	6-19
6.2.11	Mode loading sensor board ass'y	6-19
6.2.12	LED board	6-19
6.2.13	Infrared board ass'y	6-20
6.2.14	Cassette housing board	6-20
6.2.15	Terminal board ass'y	6-20
6.2.16	Remote control terminal board ass'y	6-20
6.2.17	Take-up sensor board ass'y	6-21
6.2.18	FG board ass'y	6-21
6.2.19	Drum motor board ass'y	6-21
6.2.20	Mode control motor board	6-21
6.2.21	Remote control board	6-21

Important Safety Precautions

Prior to shipment from the factory, JVC products are strictly inspected to conform with the recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

● Precautions during Servicing

1. Locations requiring special caution are denoted by labels and inscriptions on the cabinet, chassis and certain parts of the product. When performing service, be sure to read and comply with these and other cautionary notices appearing in the operation and service manuals.

2. Parts identified by the ⚠ symbol and shaded (▒▒) parts are critical for safety.
   Replace only with specified part numbers.
   Note: Parts in this category also include those specified to comply with X-ray emission standards for products using cathode ray tubes and those specified for compliance with various regulations regarding spurious radiation emission.

3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads

4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers
   4) Insulation sheets for transistors

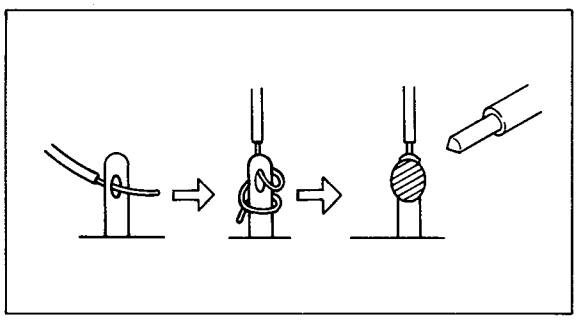


Fig. 1

5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.) wrap ends of wires securely about the terminals before soldering.

6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)

7. Check that replaced wires do not contact sharp edged or pointed parts.

8. When a power cord has been replaced, check that 10—15 kg of force in any direction will not loosen it.

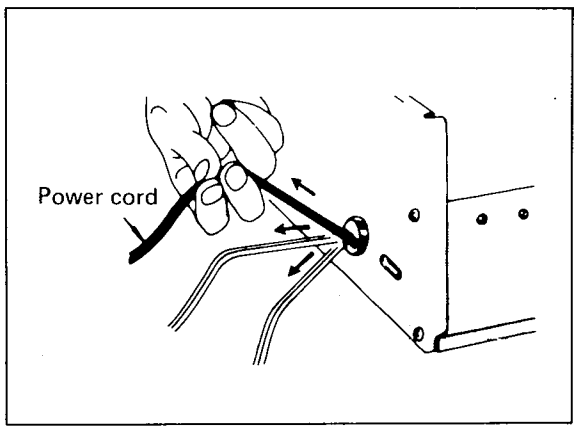


Fig. 2

9. Also check areas surrounding repaired locations.

10. Products using cathode ray tubes (CRTs)
    In regard to such products, the cathode ray tubes themselves, the high voltage circuits, and related circuits are specified for compliance with recognized codes pertaining to X-ray emission. Consequently, when servicing these products, replace the cathode ray tubes and other parts with only the parts specified. Under no circumstances attempt to modify these circuits. Unauthorized modification can increase the high voltage value and cause X-ray emission from the cathode ray tube.

11. Crimp type wire connector

In such cases as when replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, if replacing the connectors is unavoidable, in order to prevent safety hazards, perform carefully and precisely according to the following steps.

1. Connector part number : E03830-001
2. Required tool : Connector crimping tool of the proper type which will not damage insulated parts.
3. Replacement procedure

   1) Remove the old connector by cutting the wires at a point close to the connector.
   Important : Do not reuse a connector (discard it).
   2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.
   3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.
   4) As shown in Fig. 6, use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.
   5) Check the four points noted in Fig. 7.

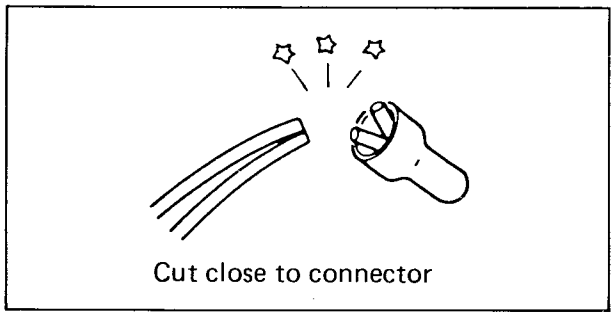


Fig. 3

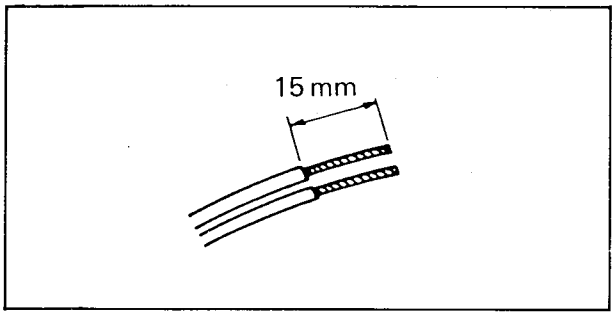


Fig. 4

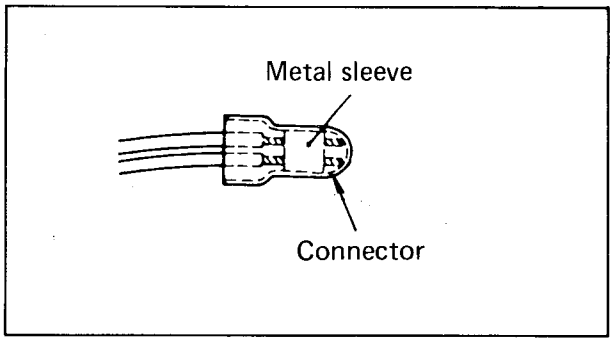


Fig. 5

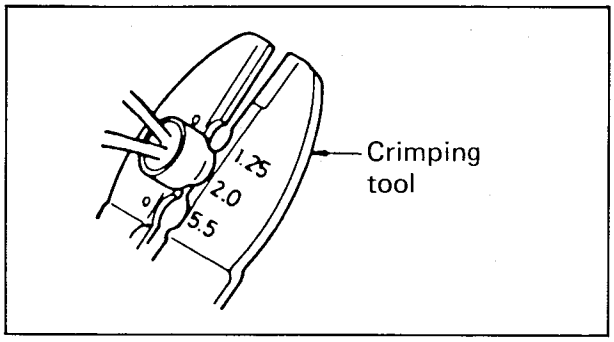


Fig. 6

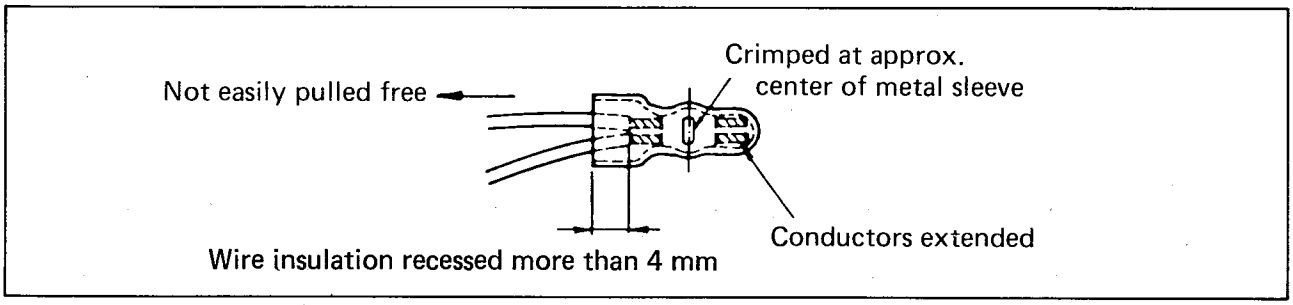

Not easily pulled free
Crimped at approx. center of metal sleeve
Conductors extended
Wire insulation recessed more than 4 mm

Fig. 7

● Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions. Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

1. Insulation resistance test

Confirm the specified insulation resistance or greater between power cord plug prongs and externally exposed parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.

2. Dielectric strength test

Confirm specified dielectric strength or greater between power cord plug prongs and exposed accessible parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.) See table below.

3. Clearance distance

When replacing primary circuit components, confirm specified clearance distance (d),(d') between soldered terminals, and between terminals and surrounding metallic parts. See table below.

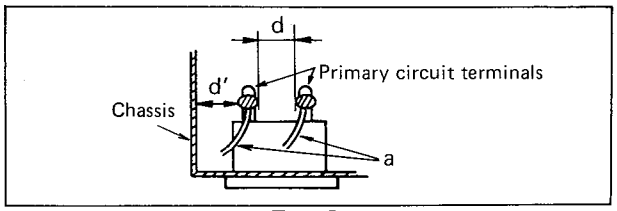


Fig. 8

Table 1: Ratings for selected areas

AC Line Voltage	Region	Insulation Resistance	Dielectric Strength	Clearance Distance(d),(d')
100 V	Japan	≧ 1 MΩ/500 V DC	1 kV 1 minute	≧ 3 mm
110 to 130 V	USA & Canada	– – –	900 V 1 minute	≧ 3.2 mm
* 110 to 130 V 200 to 240 V	Europe Australia	≧ 10 MΩ/500 V DC	4 kV 1 minute	≧ 6 mm (d) ≧ 8 mm (d') (a: Power cord)

* Class II model only.

Note. This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

4. Leakage current test

Confirm specified or lower leakage current between B(earth ground, power cord plug prongs) and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.).

Measuring Method: (Power ON)
Insert load Z between B(earth ground,power cord plug prongs) and exposed accessible parts. Use an AC voltmeter to measure across both terminals of load Z. See figure and following table.

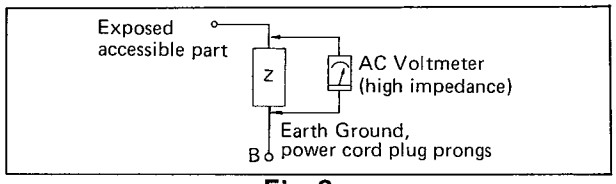


Fig. 9

Table 2: Leakage current ratings for selected areas

AC Line Voltage	Region	Load Z	Leakage Current (i)	Earth Ground (B) to:
100 V	Japan	1 kΩ	i ≦ 1m A rms	Exposed accessible parts
110 to 130 V	USA & Canada	0.15 μF, 1.5 kΩ	i ≦ 0.5m A rms	Exposed accessible parts
110 to 130 V 200 to 240 V	Europe Australia	2 kΩ	i ≦ 0.7 m A peak i ≦ 2 m A dc	Antenna earth terminals
		50 kΩ	i ≦ 0.7 m A peak i ≦ 2 m A dc	Other terminals

Note. This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

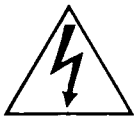
HR-D150U

INSTRUCTIONS

For reference, the text of the instruction booklet of this model is reproduced in the following pages.
Numbering of the pages also corresponds with that of the booklet.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Note to CATV system installer:
This reminder is provided to call the CATV system installer's attention to Article 820-22 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

This video cassette recorder should be used with AC 120 V~, 60 Hz only.
CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

CAUTION
To prevent electric shock, do not open the cabinet. No user serviceable parts inside. Refer servicing to qualified service personnel.

CAUTION
When you are not using the HR-D150U for a long period of time, it is recommended that you disconnect the power cord from the AC outlet.

VHS

Only cassettes marked "VHS" can be used with this video cassette recorder.

Thank you for purchasing the JVC HR-D150U Color Video Cassette Recorder. This unit is based on the VHS system developed by JVC for full home video entertainment. Find enclosed in the carton a remote control unit, which can also serve as the control panel when attached to the recorder. Once a cassette is loaded, major recorder functions (including the ejection of the cassette) can be controlled from a distance. With the HR-D150U, you can record a TV program while you are watching it or another and, with the 14-day/4-event programmable timer, record programs when you are not at home.

Before using this video recorder, read this instruction booklet carefully so that you will obtain best results from your HR-D150U.

CONTENTS

Precautions 2
Features 3
Controls, indicators and connectors 4
Detachable control panel 7
Video channel setting 7
Clock setting 8
Connections 9
Pre-tuning the built-in tuner 11
Loading and unloading a cassette 13
Recording TV programs 14
Playing back a video cassette 15
Counter memory and counter/lap functions 16
Automatic timer recording 17
Important information on timer recording 18
Instant recording 20
Recording with a video camera 21
In case of difficulty 22
Head cleaning 22
Specifications 23

CAUTION
TO PREVENT ELECTRIC SHOCK DO NOT USE THIS POLARIZED PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

NOTE: The rating plate and the safety caution are on the rear of the unit.

JVC COMPANY OF AMERICA
Division of US JVC CORP.
41 Slater Drive, Elmwood Park, New Jersey 07407

COPYRIGHT © 1984 VICTOR COMPANY OF JAPAN, LTD.

Printed in Japan

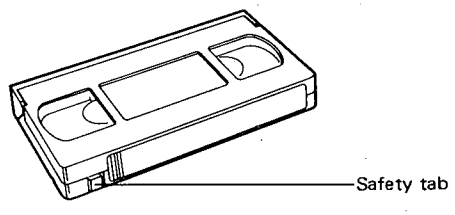
PRECAUTIONS

Handling and storage

- Avoid using the recorder under the following conditions:
  - extremely hot, cold or humid places,
  - dusty places,
  - near appliances generating strong magnetic fields,
  - places subject to vibrations, and
  - poorly ventilated places.
- Be careful of moisture condensation.
  Avoid using the recorder immediately after moving from a cold place to a warm place or soon after heating a room which was cold. The water vapor in warm air will condense on the still-cold video head drum and tape guides and may cause damage to the tape and the recorder.
- Handle the recorder carefully.
  - Do not block the ventilation openings.
  - Do not place anything heavy on the recorder.
  - Do not place anything which might spill and cause trouble on the top cover of the recorder.
  - Use in horizontal (flat) position only.
- In case of transportation,
  - Avoid violent shocks to the recorder during packing and transportation.
  - Before packing, be sure to remove the cassette from the recorder.

Video cassettes

- This recorder employs VHS-type cassettes only.
  T-160 for 160/480 minutes, T-120 for 120/360 minutes, T-90 for 90/270 minutes, T-60 for 60/180 minutes and T-30 for 30/90 minutes of recording.
- Video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has already been removed, use adhesive tape to block the hole.



- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.
- Avoid extreme humidity, violent vibrations or shocks, strong magnetic fields (near a motor, transformer or magnet) and dusty places.
- Place the cassettes in cassette cases and position vertically.

Moisture condensation

- If you pour a cold liquid into a glass, water vapor in the air will condense on the surface of the glass. This is called moisture condensation.
- Moisture condensation on the head drum, one of the most crucial parts of the video recorder, will cause damage to the tape.
- Moisture in the air will condense on the recorder when you move it from a cold place to a warm place, after heating a cold room or under extremely humid conditions.
- This recorder is equipped with a moisture condensation prevention circuit which automatically heats the head drum according to the ambient temperature. This circuit operates only when the unit is plugged into an AC outlet.
- The moisture condensation prevention circuit consumes only a slight amount of power. However, if for some reason you are not using the recorder for a long period of time, it is advisable to remove the power cord from the AC outlet.
- Since the moisture condensation prevention circuit cannot evaporate existing moisture condensation immediately after the power cord has been plugged into the AC outlet, you must allow for a few hours if the recorder is to be used in such areas as would occasion moisture condensation.

Operation

- When a cassette is loaded, the power is switched on automatically.
- The cassette can be unloaded even when the power is off. Pressing the EJECT button turns the power on and, after ejection of the cassette, shuts it off automatically in this case.
- As long as the TIMER button is in the ON position, the POWER and EJECT buttons have no effect and loading or unloading of a cassette is not possible. Do not force a cassette into the slot in this situation.

Remote control unit

- Avoid violent shocks, especially take care not to drop the unit.
- Take care not to allow liquid to spill into the unit or dampen the terminals.
- Do not place heavy objects on the unit.
- Avoid leaving the unit in places subject to direct sunlight or extremely high temperatures.

FEATURES

4-Head system for SP/EP recording
8-Hour recordings are possible in the EP (Extended Play) mode with T-160 cassettes.
Automatic switching between SP (Standard Play), LP (Long Play) and EP (Extended Play) mode tapes during playback.

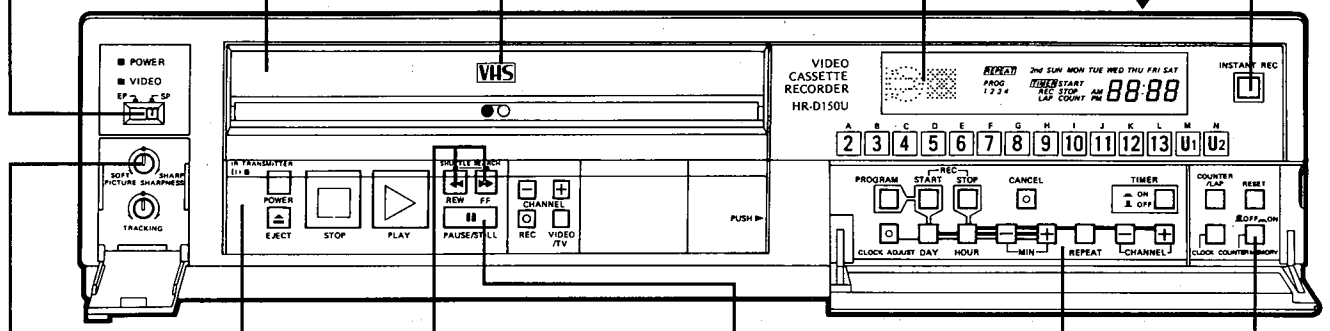
Motorized front-loading system
The cassette loading slot is equipped with two separate door flaps; for easy identification of the presence of a cassette inside, a "cassette inserted" mark appears on the lower door flap when the cassette is inserted.

Auto-power system
Inserting a cassette automatically turns the recorder on. Cassette ejection is possible with the power off.

105-Channel cable-compatible electronic tuner with 14-channel preset capacity

Instant recording facility
Simple, one-touch recording function for up to 4 hours of recording.

Comprehensive fluorescent tube display with symbolic mode indicators
Switchable among clock, tape counter, elapsed time counter and programmed timer recording data display.



Detachable control panel
Functions as an infrared remote control unit.

Picture sharpness control
Sharper or softer pictures according to your preference.

Shuttle search for quick program location
Approximately 7 times normal speed in either direction in both SP and EP modes.

Counter search function

14-Day/4-event programmable timer
Easy to set for unattended recording. Serial recording of regularly broadcast programs is also possible.

Still playback and frame advance
Slow-motion effect is also available by continuous frame advance.

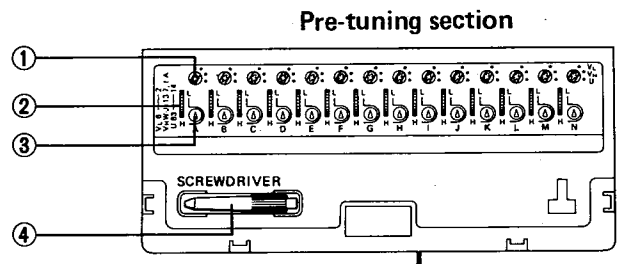
- Standard prerecorded cassettes can be played back in the SP mode with better picture and sound quality.
- **Auto rewind at tape end**
- **Automatic release mechanism**
  Protects tape by releasing Pause/Still mode after about 5 minutes.
- **Brushless, quartz-locked, direct-drive drum motor**
  For greater reliability, plus independent capstan, tape loading and cassette loading motors.
- **Automatic input switching**
  Connecting another source component to the rear panel VIDEO IN and/or AUDIO IN connectors automatically engages the external input recording mode.

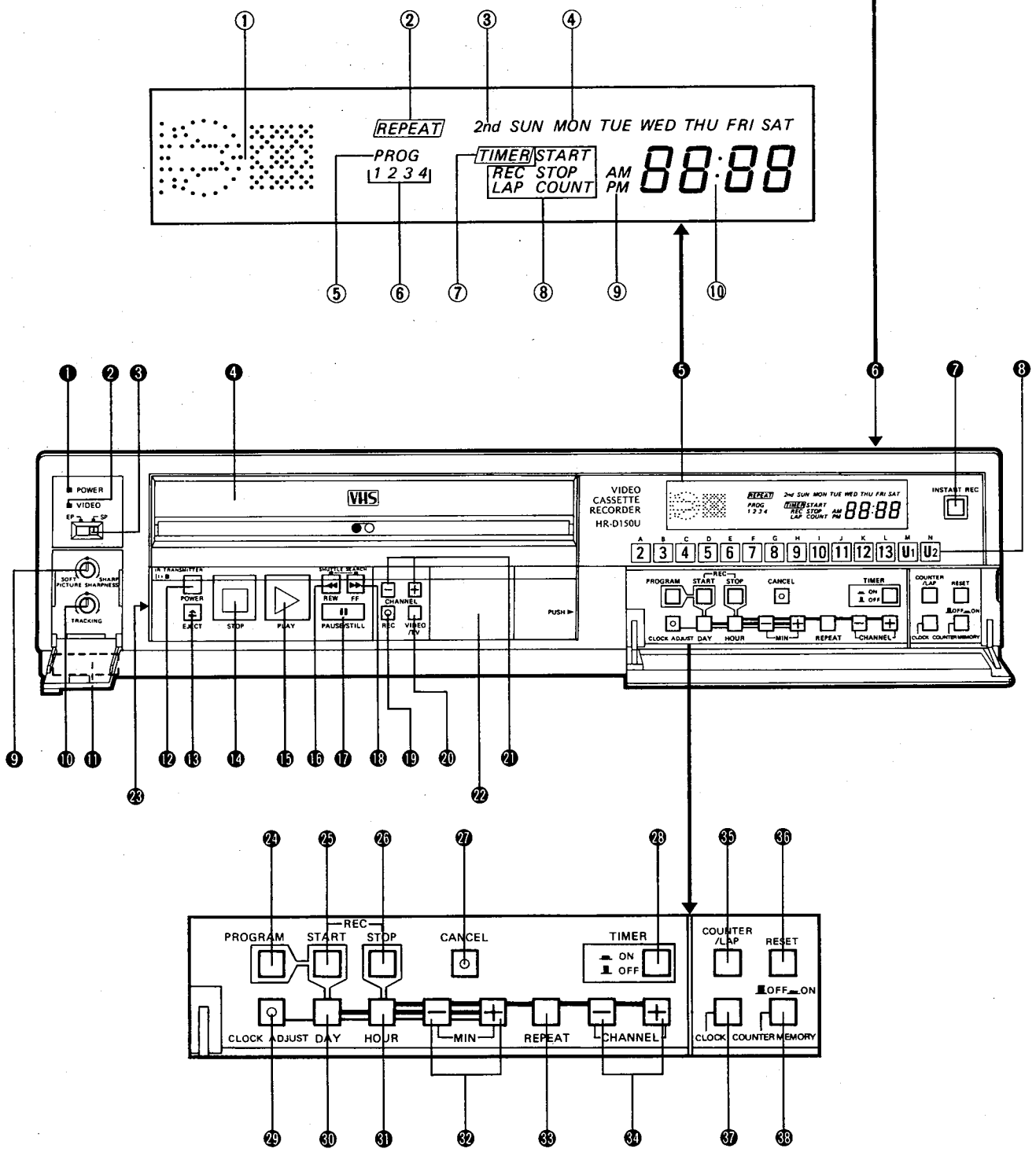
CONTROLS, INDICATORS AND CONNECTORS

Keep this page opened so that you can refer to it at any time when you are reading this booklet.

For the sake of convenience, illustrations throughout show the control panel attached to the main unit. For attachment and removal of the control panel, refer to page 7.

Front panel





❶ **POWER indicator**

❷ **VIDEO mode indicator**

❸ **Recording mode select switch (SP/EP)**
Set to SP (Standard Play) when you wish recordings to be made in the standard mode with better picture and sound quality. Set to EP (Extended Play) when you wish to record longer TV shows or for unattended and prolonged recording of TV serials up to 8 hours. This switch has no effect during playback.

❹ **Cassette loading slot**

❺ **Fluorescent display panel**

① **Symbolic mode indicator**
Illuminates to give quick, easy visual reference of the operating mode. Combinations of 5 different symbols indicate 8 operating modes:

PLAY:	▷	REWIND:	◁◁
STILL:	▯▯	FAST FORWARD:	▷▷
RECORD:	○	REVERSE SHUTTLE SEARCH:	▷ ◁◁
RECORD PAUSE:	○ ▯▯	FORWARD SHUTTLE SEARCH:	▷ ▷▷

② **REPEAT indicator**
Illuminates when the REPEAT button ㉝ is pressed in the Program Set mode or when an everyday indication is obtained by pressing the DAY button ㉚ for daily serial recording.

③ **Week indicator**
"2nd" will be illuminated when the timer is set for recording to start on a day in the second week from setting.

④ **Day indicator**

⑤ **PROG indicator**
Illuminates when the PROGRAM button ㉙ is pressed.

⑥ **Program number**
Numerals 1 through 4 illuminate successively each time the PROGRAM button ㉙ is pressed to show which program is ready for entry.

⑦ **TIMER indicator**
Illuminates when the TIMER button ㉘ is pressed to ON to show that the recorder has been properly preset for timer recording.

⑧ **Display mode indicators**
START: Flashes for switch-on time setting.
STOP: Flashes for switch-off time setting.
REC STOP: Flashes or lights during instant recording.
LAP: Lights when the Lap mode is engaged.
COUNT: Lights when the Counter mode is engaged.

⑨ **AM/PM indicator**

⑩ **Clock/Counter/Lap/Timer display**
Clock: 12-hour AM/PM time indication
Counter: 4-digit tape counter
Lap: elapsed recording time in hours and minutes
Timer: programmed timer recording data

❻ **Pre-tuning section**

① **Band selector**

② **Tuning control**

③ **Tuning indicator**

④ **Screwdriver for operating the band selector**

❼ **INSTANT REC button**
Use this button to start recording instantly and stop automatically after a specific time. (See page 20.)

❽ **Channel indicators**

❾ **PICTURE SHARPNESS control**
Turn this knob clockwise to make the picture sharper. Turn counterclockwise to give the picture a softer tone. Effective only for playback pictures.

❿ **TRACKING control**
Turn to minimize noise bars, if observed, during normal-speed playback.

⓫ **Infrared beam receiving window**

⓬ **POWER button**
Press to apply power to the HR-D150U for recording or playback. The POWER indicator ❶ will light. Loading a cassette also turns the power on.

⓭ **EJECT button**

⓮ **STOP button**
Press to stop the tape.

⓯ **PLAY button**
Press to play back the tape or release the Pause/Still mode. Also, press this button together with the REC button to record.

⓰ **REW/SHUTTLE SEARCH button**
To rewind the tape, press this button while in the Stop mode. To view the speeded-up picture in the reverse direction for program search, hold this button pressed while in the Play mode.
Note: No picture appears on the TV screen while shuttling in the LP mode.

⓱ **PAUSE/STILL button**
Press to stop the tape temporarily to avoid recording of unwanted material. When this button is pressed during playback, a still picture will appear.
The still picture can be advanced in a frame-by-frame manner each time this button is pressed. Holding this button pressed continuously advances the picture in a frame-by-frame manner to give a slow-motion effect.
Note: No still picture is available in the LP mode.

⓲ **FF/SHUTTLE SEARCH button**
To fast forward the tape, press this button while in the Stop mode. To view the speeded-up picture in the forward direction for program search, hold this button pressed while in the Play mode.
Note: No picture appears on the TV screen while shuttling in the LP mode.

⓳ **REC button**
Press together with the PLAY button for recording.

⓴ **VIDEO/TV button**
Selects between TV and VIDEO modes.
TV mode (the VIDEO indicator is off): for TV viewing and for watching a TV program while recording another.
VIDEO mode (the VIDEO indicator lights): for recording a TV program while watching it and for playing back recorded tapes. When the power is switched on, initially the TV mode is engaged. If you want to change the mode, press the VIDEO/TV button.

㉑ **CHANNEL +/– buttons**
Press to tune to preset stations; the "+" button for scanning in the direction of increasing channel numbers and the "–" button in the direction of decreasing channel numbers. The selected channel will appear in the channel display.

㉒ **Slide cover**
To avoid accidental touching of the buttons ⓳ ⓴ and ㉑, slide the cover to the left.

㉓ **Infrared beam transmitting port (IR TRANSMITTER)**
Direct this port at the infrared beam receiving window ⓫ when using the control panel as a remote control unit.

㉔ **PROGRAM button**
Press this button when you want to preset the timer for unattended recording. The entire display will change to the Program Set mode, with PROG and numeral 1 illuminated. This shows that program memory No. 1 is ready to accept entries. To change the program number, press this button until the number of the program memory you want to use illuminates.

㉕ **REC START button**
Press for checking and resetting the day and switch-on time for automatic timer recording.

㉖ **REC STOP button**
Press for setting the switch-off time for automatic timer recording.

㉗ **CANCEL button**
Press this button to cancel or "clear" the preset data.

㉘ **TIMER button**
Press to ON (▬) after you have preset the recorder for unattended timer recording.

㉙ **CLOCK ADJUST button**
Hold this button pressed for clock setting. Use the DAY, HOUR, MIN + and MIN - buttons to set the day and time.

㉚ **DAY button**
Press until a desired day indication appears on the display for clock and timer settings.

㉛ **HOUR button**
Press to obtain the required hour indication for clock and timer settings.

㉜ **MIN -/+ buttons**
Press to obtain the required minute indication for clock and timer settings; "-" to decrease the indication and "+" to increase the indication.

㉝ **REPEAT button**
After you have entered all data for each program for unattended recording, if you wish the entered data to be kept for serial recording, press this button.

㉞ **CHANNEL -/+ buttons**
Press either button to obtain a desired channel indication in the Program Set mode.

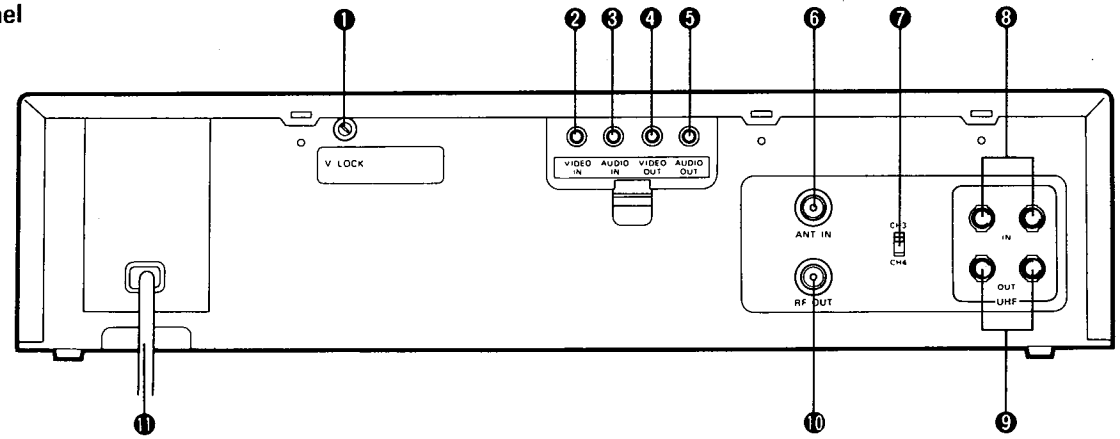
㉟ **COUNTER/LAP button**
Press this button to change the display to the Counter or Lap mode. (See page 16.)

㊱ **Counter/Lap RESET button**

㊲ **CLOCK button**
Press this button to change the display to the Clock mode. (See page 8.)

㊳ **COUNTER MEMORY button**
When this button is pressed to ON (▬), the tape will stop automatically at the counter reading of about "0000" in the Rewind or Fast Forward mode.

Rear panel



❶ **V. LOCK adjustment screw**
When operating in the Still mode, adjust this screw to eliminate any vertical vibration of the picture. (For any inquiry about this adjustment, contact a JVC Service Center.)

❷ **VIDEO IN terminal**
Connect to the VIDEO OUT terminal of another video recorder for tape-to-tape transfer, or the VIDEO OUT terminal of the camera adapter for camera recording.

❸ **AUDIO IN terminal**
Connect to the AUDIO OUT terminal of another video recorder for tape-to-tape transfer, or the AUDIO OUT terminal of the camera adapter for camera recording.

❹ **VIDEO OUT terminal**
Connect to the VIDEO IN terminal of another video recorder for tape-to-tape transfer, or the VIDEO IN terminal of a video monitor for playback.

❺ **AUDIO OUT terminal**
Connect to the AUDIO IN terminal of another video recorder for tape-to-tape transfer, or the AUDIO IN terminal of a video monitor for playback.

❻ **ANT IN terminal**
Connect the 75-ohm VHF antenna coaxial cable to this terminal.

❼ **RF output channel select switch**
(See page 7.)

❽ **UHF IN antenna terminals**
Connect the feeder from the UHF antenna to these terminals.

❾ **UHF OUT antenna terminals**
Connect to the UHF antenna terminals of a TV receiver through a UHF antenna cable.

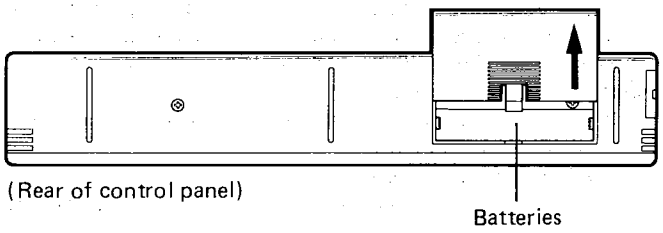
❿ **RF OUT connector**
Connect to the VHF antenna connector of a TV receiver through the VHF antenna cable (provided).

⓫ **AC power cord**
Connect to an AC 120 V∿, 60 Hz AC outlet.

DETACHABLE CONTROL PANEL

The control panel is separately packed. With the batteries (provided) installed, it can be used as an infrared remote control unit. When attached to the recorder, it functions as an ordinary control panel. In this case, the batteries are not needed.

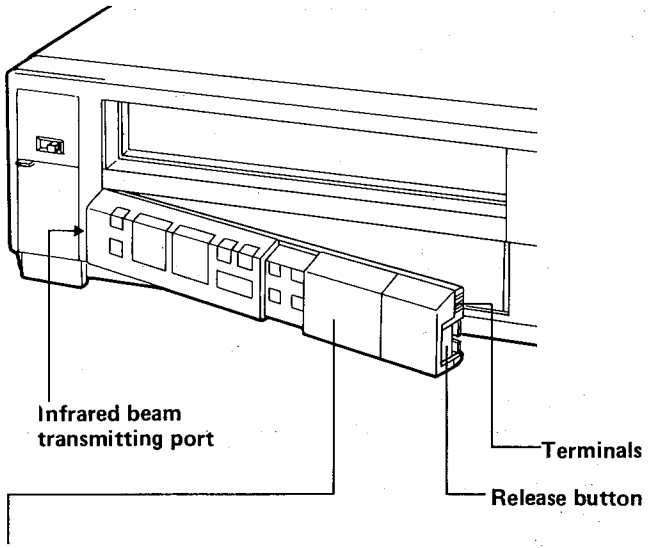
Installing the batteries



1. Slide the battery compartment cover on the rear of the unit to remove.
2. Insert 2 "AAA"-size batteries (provided) in the correct directions into the battery compartment.
3. Replace the cover.

Attaching to the recorder

Install the control panel in the recorder by inserting the left end first. Then press the right side until a click is heard. (Do not force it in.)



Slide cover

To avoid accidental touching of the CHANNEL, REC and VIDEO/TV buttons, slide this cover to the left.

Removing the control panel

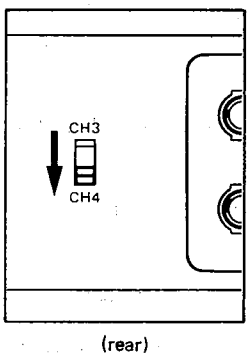
Simply press the release button on the right end of the control panel.

Notes:

- Always keep the terminals on the rear of the control panel clean. When they become dirty, wipe them clean with a cloth.
- If the batteries are discharged or too low for normal remote operation, attach the unit to the recorder and use the control buttons as usual.

VIDEO CHANNEL SETTING

The built-in RF converter permits playback of video and audio recordings through a TV receiver. The signals from the RF converter are viewed through a vacant channel not used for broadcasting in your viewing area.



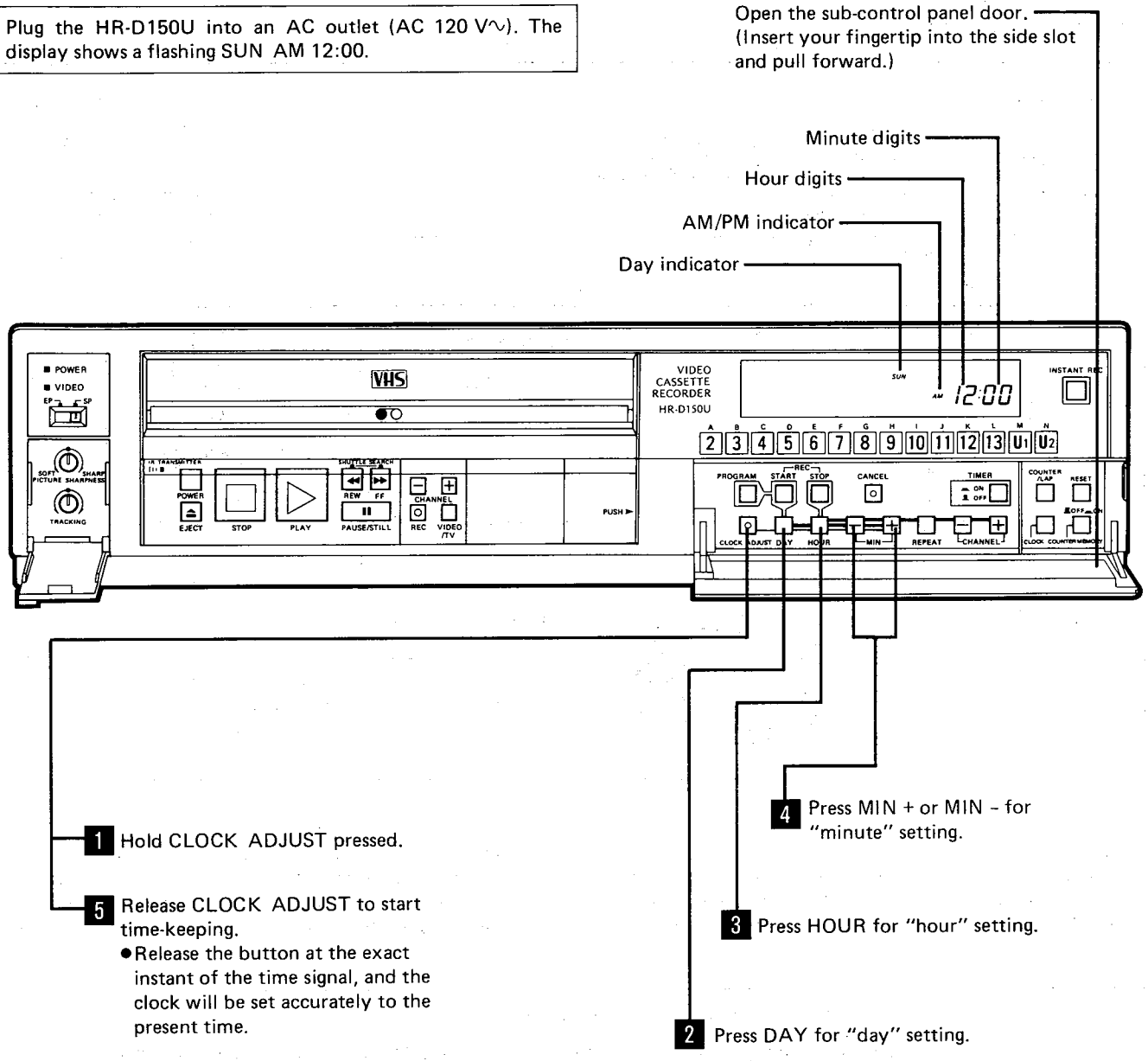
The converter channel of all units is set to 3 prior to shipment from the plant. Reset the channel to 4 in areas where channel 3 is employed for broadcasting.

For this purpose, with UNIT UNPLUGGED, carefully insert a small flat-head screwdriver into the hole provided on the rear of the unit and slide the channel select switch to CH 4.

This is YOUR video channel. To view video cassettes, always set the TV channel selector to either channel 3 or 4.

CLOCK SETTING

Plug the HR-D150U into an AC outlet (AC 120 V∿). The display shows a flashing SUN AM 12:00.

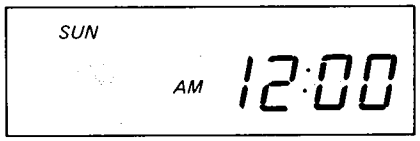

Open the sub-control panel door. (Insert your fingertip into the side slot and pull forward.)
Minute digits
Hour digits
AM/PM indicator
Day indicator
VIDEO CASSETTE RECORDER HR-D150U
SUN
AM 12:00
INSTANT REC
1 Hold CLOCK ADJUST pressed.
5 Release CLOCK ADJUST to start time-keeping.
● Release the button at the exact instant of the time signal, and the clock will be set accurately to the present time.
4 Press MIN + or MIN - for "minute" setting.
3 Press HOUR for "hour" setting.
2 Press DAY for "day" setting.

Note

- This clock uses the 12-hour, AM/PM time indication.
- Holding the DAY, HOUR, MIN + and MIN - buttons pressed continuously advances the corresponding indication automatically. Pressing either of them once advances the indication in single increments only.
- Clock setting is not possible if the TIMER button is in the ON (▬) position. First check to see that it is in the OFF (▲) position.

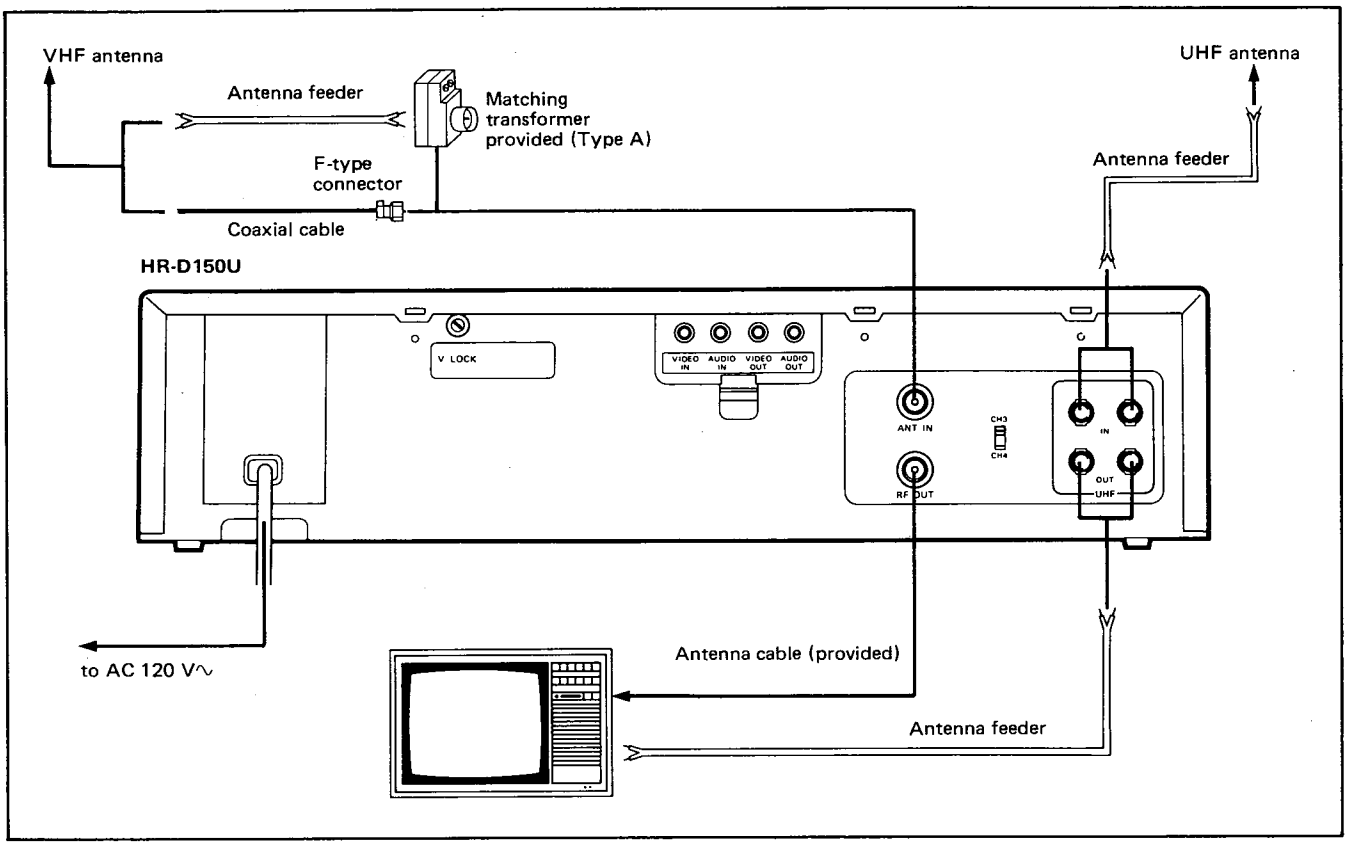
Power failure indicator

The entire clock display may start to flicker fast. This is not a malfunctioning of the clock, but it indicates that there has been a power failure. Re-adjusting the time restores the normal condition of the clock display.



CONNECTIONS

To VHF and UHF antennas

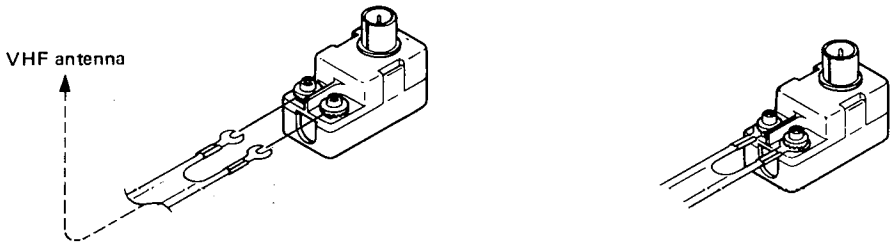


Procedure

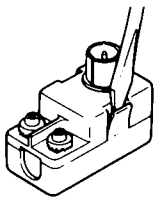
- Remove the VHF and UHF antenna cables from the TV receiver and reconnect to the HR-D150U as illustrated. The HR-D150U is then ready to record off-air programs.
- Connect the HR-D150U to the TV receiver using the VHF antenna cable (provided) and a UHF antenna cable as illustrated. The TV receiver is then ready to receive TV broadcast programs as well as accommodate video cassette playback.

How to affix the matching transformer to your VHF antenna cable

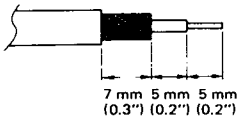
- If your VHF antenna cable is a 300-ohm flat feeder, connect the two lugs to the screws in an ordinary manner.



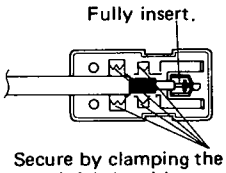
- If your VHF antenna cable is a 75-ohm coaxial cable, proceed as follows:



1. Prize open the cover with a screwdriver or the like.



2. Strip the coaxial cable with a pair of wire strippers, a knife, or the like as shown.

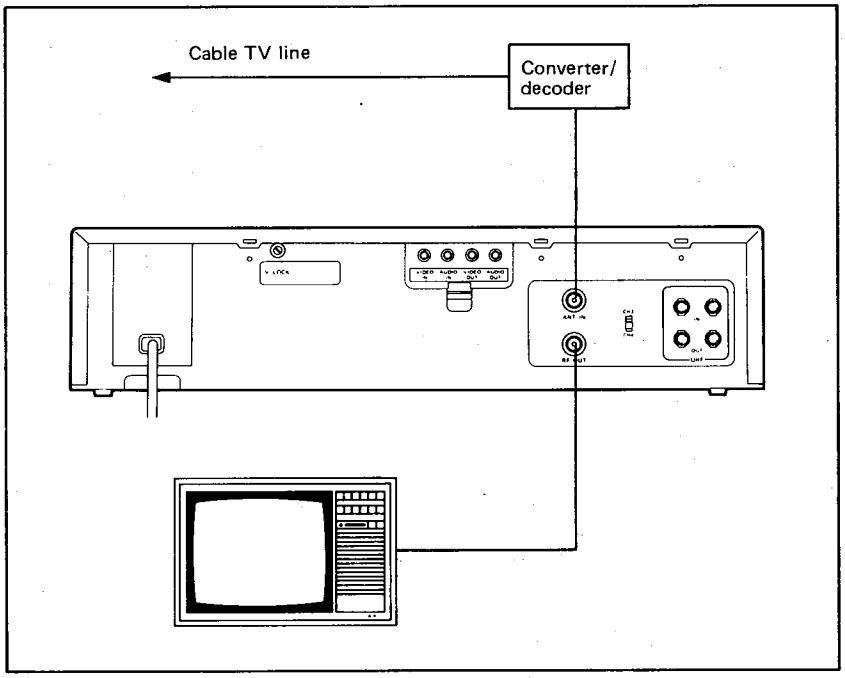


3. Insert the stripped end of the cable as shown.

4. Replace the cover.

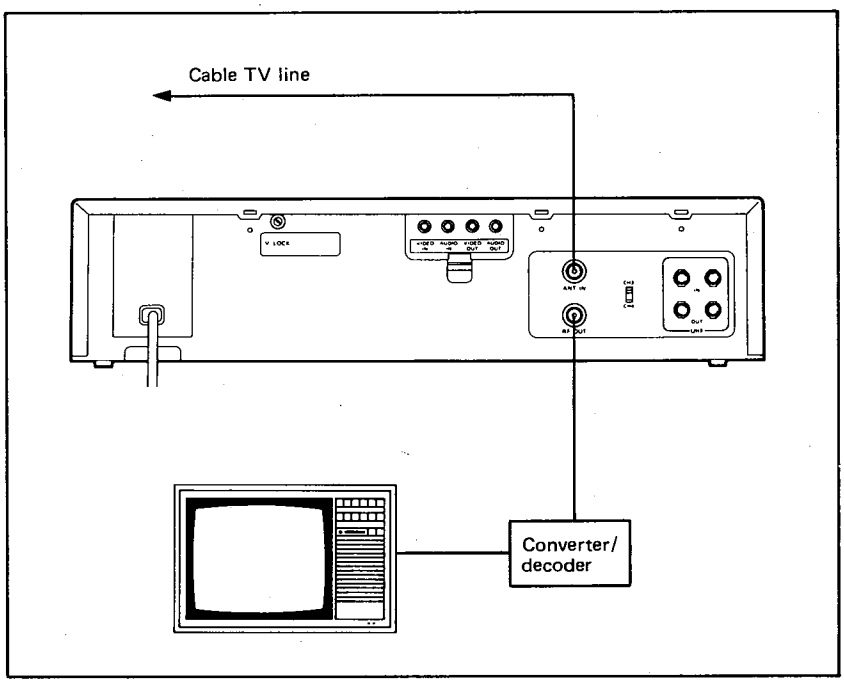
To cable TV line

There are several different systems of cable television at present. Therefore, there may be various situations where you use your HR-D150U in combination with cable TV services. The following examples show two possible connections for cable TV systems which use a converter/decoder to tune to regular and "scrambled signal" cable channels. If your cable TV system does not require a converter/decoder for scrambled signals, you can use the cable-compatible tuner built into the HR-D150U for viewing and recording. In this case, simply connect the cable TV line to the ANT IN terminal of the recorder and the RF OUT terminal of the recorder to your TV receiver. Please contact your cable TV company for any questions concerning hookups or cable TV operation.



Example 1

- You can record any available cable TV channel while watching it.
- Select the recording channel on the converter/decoder.
- Set the recorder to the output channel of the converter/decoder (channel 3 or 4).
- Set the TV receiver to channel 3 or 4.
- Set the VIDEO/TV button on the recorder to VIDEO (the VIDEO indicator lights).



Example 2

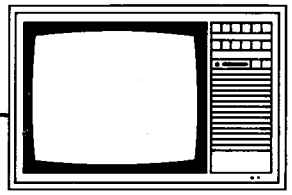
- You can record any regular cable TV channel while watching it or any other channel including "scrambled signal" channels.
  Note: "Scrambled signal" channels cannot be recorded.
- Select the recording channel on the recorder.
- Select the viewing channel on the converter/decoder.
- Set the TV receiver to the output channel of the converter/decoder (channel 3 or 4).
- Set the VIDEO/TV button as necessary.

To play back a cassette:

- Set the input channel of the converter/decoder to channel 3 or 4.
- Set the TV receiver to the output channel of the converter/decoder (3 or 4).
- Set the VIDEO/TV button on the recorder to VIDEO.

PRE-TUNING THE BUILT-IN TUNER

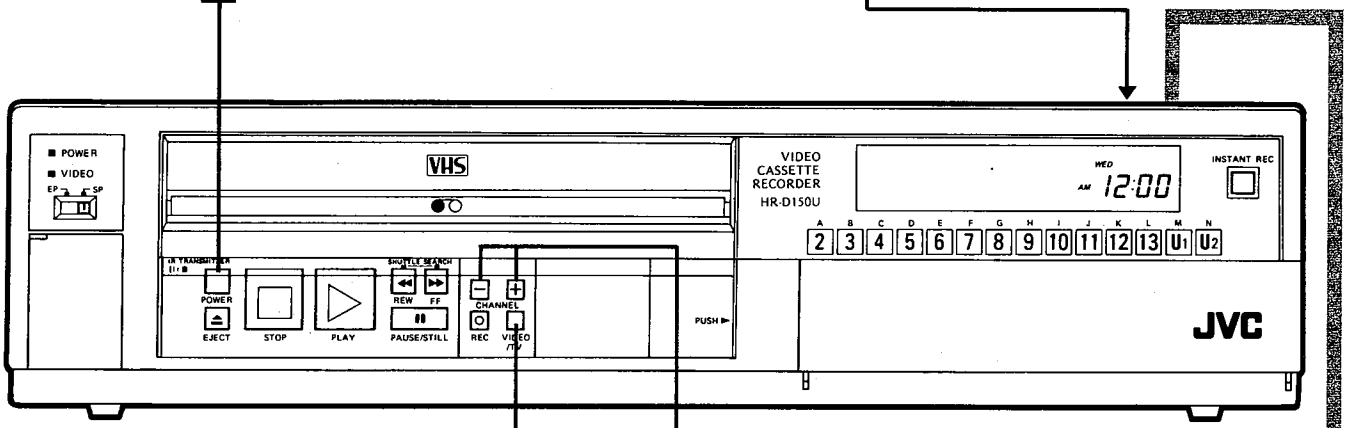
2 Switch ON.
- Adjust the TV receiver's channel to your video channel (3 or 4).



4 Open the pre-tuning control compartment cover.

10 After completing pre-tuning for all channels, close the cover.
- Store the screwdriver in the original pocket for future use.

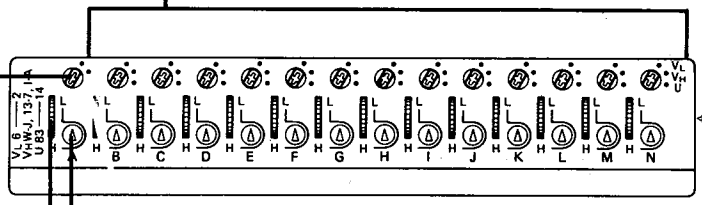
1 Press POWER.



3 Press VIDEO/TV to turn the VIDEO indicator on.

5 Press the CHANNEL button ("+" or "–") to allocate a channel for the station to be pre-tuned in. The channel number corresponding to the selected channel will be illuminated.

9 Perform pre-tuning for all channels by repeating steps **5** through **8**.

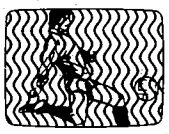


Tuning indicator

6 Set the VHF/UHF band selector corresponding to the selected channel as required, using the screwdriver provided.
Set to VL when tuning in to VHF channels 2 through 6.
Set to VH when tuning in to VHF channels A through I, 7 through 13 and J through W.
Set to U when tuning in to UHF channels 14 through 83.

7 Turn the tuning control corresponding to the selected channel while observing the TV screen until a desired station is tuned in.
- Turning the tuning control in either direction moves the tuning indicator.

8 **FINE ADJUSTMENT**
To obtain the best possible picture, first turn the tuning control until you get a striped picture, and then slowly turn, little by little, to clear up the picture.


Striped picture

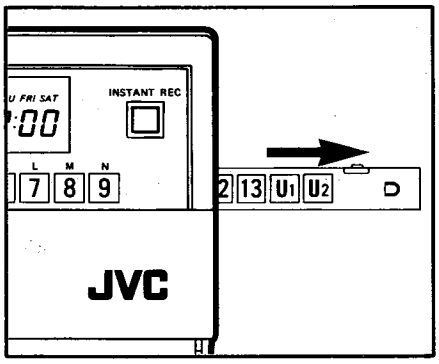
Clear picture with color

Notes:

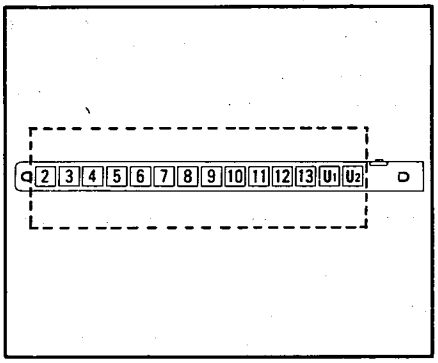
- If the picture is not clear after following all procedures described, perform the fine tuning adjustment on the TV receiver.
- Distorted pictures or sound will be recorded if fine tuning has not been properly performed. Exercise care with his adjustment since the recorded picture and sound cannot be adjusted later.

Replacing the channel numbers

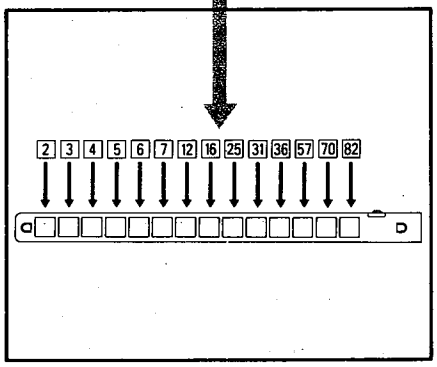
Prior to shipment, the channels on the channel indicator panel are numbered 2 through 13 plus U_1 and U_2 from left to right. To change the channel numbers to correspond to your own channel arrangement, replace the channel numbers in the following manner:



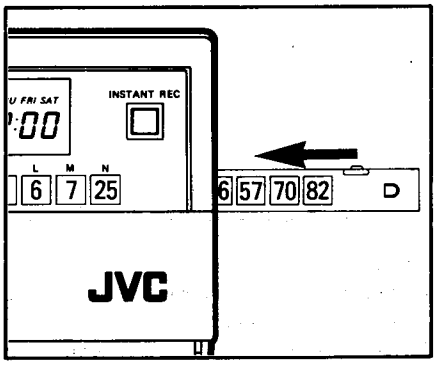
1 Pull out the channel number film holder.



2 Remove the channel number film strip.



3 Separate the appropriate numbers from the provided channel number film sheet and insert them into the holder individually to match the actual channel arrangement.



4 Insert the channel number film holder so that the numbers are clearly seen.

2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34
35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67
68	69	70	71	72	73	74	75	76	77	78
79	80	81	82	83	CBS	NBC	ABC	PBC	MTV	HBO
CNN	C1	C2	C3	C4						

LOADING AND UNLOADING A CASSETTE

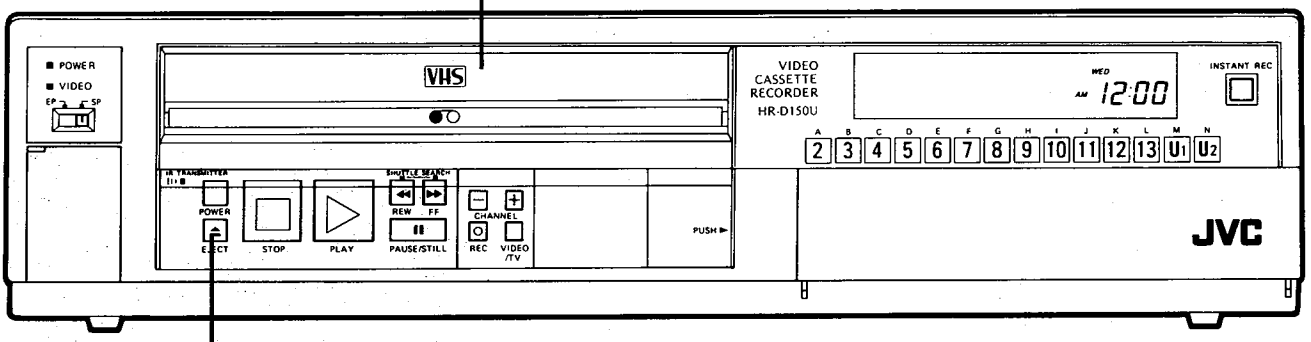
Loading

Insert a cassette with its labelled side facing you.

- With a cassette inserted, a door flap displays the mark to indicate "cassette inserted".

Note:

It might be that, after unpacking your new recorder, the "cassette inserted" mark can be seen already. This does not indicate a defective unit. Simply insert a cassette. After the first loading/unloading cycle, the door will function properly; the flap with the mark will appear when a cassette is inside and be replaced with one without a mark when the cassette is removed.



Unlaoding

Press EJECT. The cassette will be ejected.

New motorized loading system

- The cassette can be loaded even when the power has not been turned on. Inserting a cassette into the loading slot turns the power on automatically.
- The cassette can be unloaded even when the power has been turned off. If a cassette is inside, pressing the EJECT button turns the power on automatically and, after ejection of the cassette, shuts it off automatically.

Notes

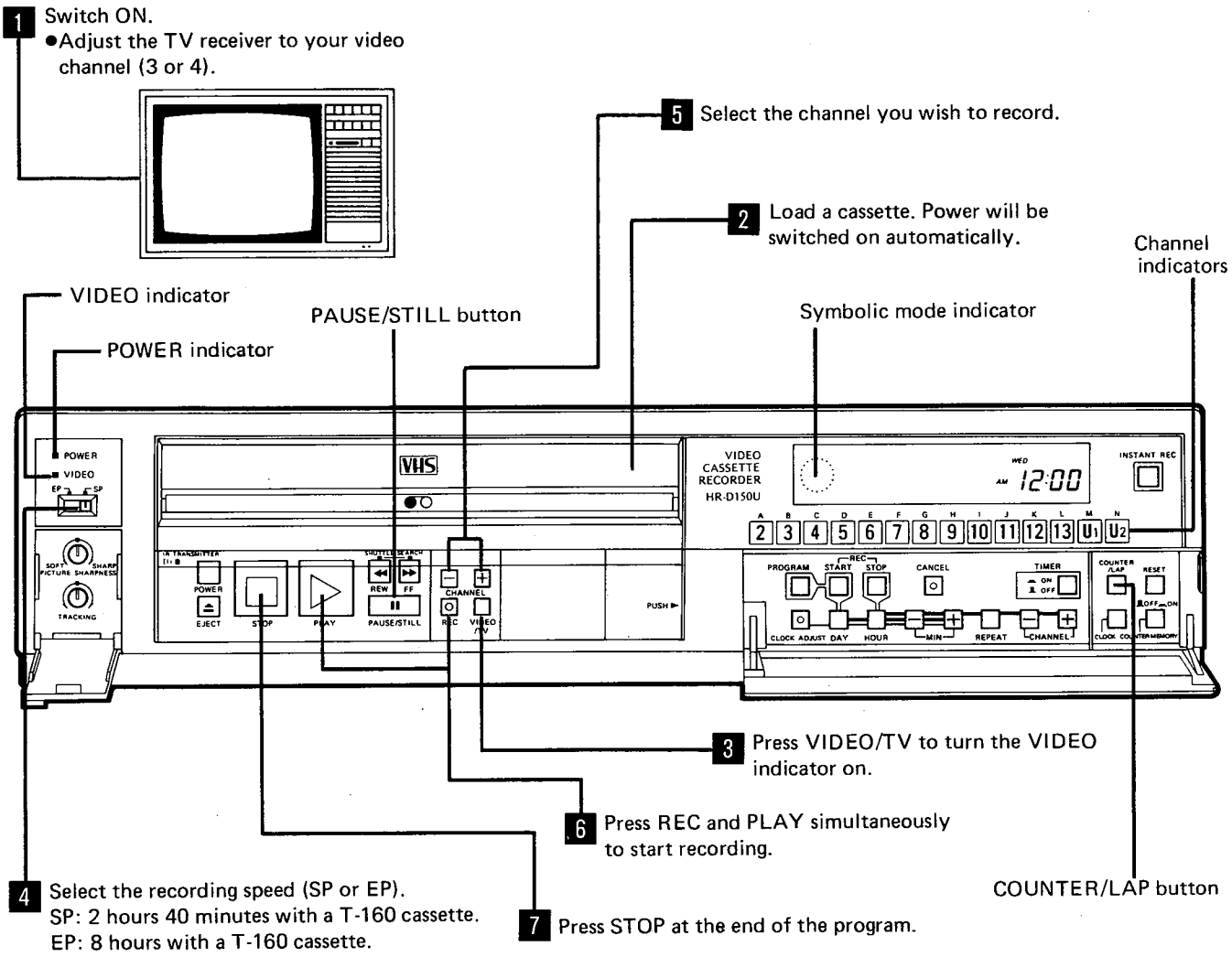
- Be sure to insert the cassette firmly into the slot; otherwise, it will be automatically ejected.
- The automatic loading mechanism will operate only when the cassette is inserted correctly.
- A cassette inverted cannot be inserted.

Caution

- If loading or unloading of a cassette is not possible, check to see whether the TIMER button is in the ON position. If so, press it to the OFF ( ) position.
- Do not attempt to pull out the cassette once automatic loading has started.
- Do not insert fingers or any foreign object beyond the door flaps of the cassette loading slot, as this could lead to injury or damage to the mechanism. Show special caution with children.

RECORDING TV PROGRAMS

Basic concept: receive the desired TV program with the built-in tuner and operate the tape section for recording.


1 Switch ON.
●Adjust the TV receiver to your video channel (3 or 4).
5 Select the channel you wish to record.
2 Load a cassette. Power will be switched on automatically.
Channel indicators
VIDEO indicator
PAUSE/STILL button
Symbolic mode indicator
POWER indicator
3 Press VIDEO/TV to turn the VIDEO indicator on.
6 Press REC and PLAY simultaneously to start recording.
4 Select the recording speed (SP or EP).
SP: 2 hours 40 minutes with a T-160 cassette.
EP: 8 hours with a T-160 cassette.
7 Press STOP at the end of the program.
COUNTER/LAP button

Notes

- If there is part of the program you don't want to record, press the PAUSE/STILL button. To release the Pause mode, press the PLAY button.
- When recording is restarted from the Pause mode, assemble recording is performed so that the playback picture will not distort at the edit point. A few frames recorded before the pause are erased due to overlap of the new recording. This is not due to any defect of the unit.
- When the Pause mode continues for longer than about 5 minutes, the Stop mode will be entered automatically.
- If the REC button cannot be engaged, check to see if the cassette safety tab has been removed. (See page 2.)
- When the end of the tape is reached during recording, the tape is automatically rewound to the beginning and stops.
- Press the COUNTER/LAP button to use the tape counter. (For more details refer to page 16.)
- Press the COUNTER/LAP button once again to check how much recording time has elapsed.
- The built-in tuner's automatic channel lock mechanism prevents the selected channel from being altered during recording. Therefore, if you wish to change the channel during recording, first engage the Pause mode and then select a different channel.

RECORDING ONE PROGRAM WHILE WATCHING ANOTHER

A program not being viewed can be recorded while you enjoy viewing another program.
This permits the recorded program to be played back later at your convenience.

The key points to be remembered are:

- Select the channel you wish to record with the recorder's channel buttons.
- Select the channel you wish to view with the TV receiver's channel selector.
- The VIDEO/TV button should be in the TV mode (VIDEO indicator off). If the indicator is lit, press the VIDEO/TV button to turn it off.

CAUTION

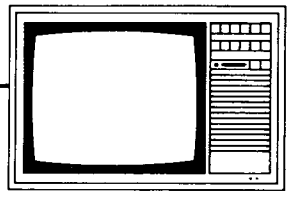
- Recording TV programs is possible only when no external source is connected to the rear panel VIDEO IN and/or AUDIO IN connectors. Connection to these terminals causes automatic input switching to record external signals.

PLAYING BACK A VIDEO CASSETTE

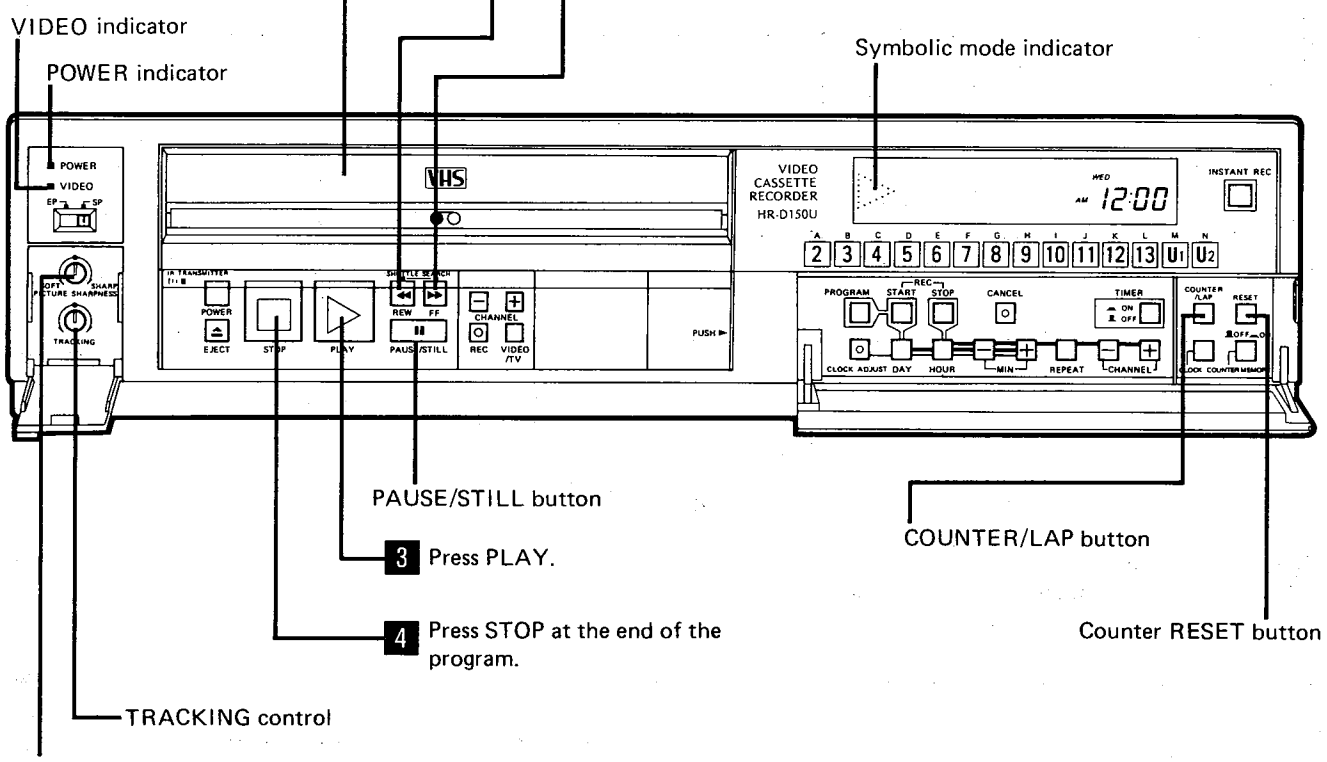
REW/SHUTTLE SEARCH button
- To rewind the tape, press this button in the Stop mode.
- To shuttle search the tape in the reverse direction, hold this button pressed in the Play mode.
- The shuttling speed is about 7 times normal in both the SP and EP modes.

FF/SHUTTLE SEARCH button
- To fast forward the tape, press this button in the Stop mode.
- To shuttle search the tape in the forward direction, hold this button pressed in the Play ;mode.
- The shuttling speed is about 7 times normal in both the SP and EP modes.

1 Switch ON.
Adjust the TV receiver's channel to the video channel (3 or 4).



2 Load a pre-recorded cassette. Power will be switched on automatically.



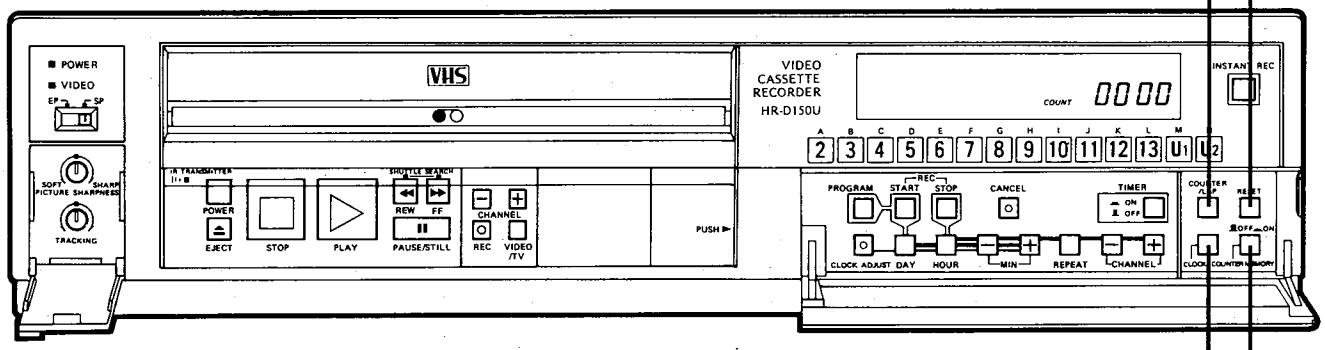
Notes

- The SP/EP switch may be in either position.
  The SP, LP or EP mode recording is automatically detected and played back at a correct speed respectively.
- The tape-end auto rewind mechanism functions in both the Play and Fast forward modes.
- Noise bars may appear on the screen if you play back a tape which was recorded using another recorder. In such cases, adjust the TRACKING control. Turn it in either direction to adjust the picture. After playing a particular tape, return the control knob to the center position.
- When the PLAY button is pressed to start playback, the VIDEO mode is automatically entered and the VIDEO indicator lights.
- When the PAUSE/STILL button is pressed during playback, a still picture will appear. The still picture can be advanced in a frame-by-frame manner each time this button is pressed. Holding this button pressed continuously advances the picture in a frame-by-frame manner to give a slow-motion effect.
- When the Still mode continues for longer than about 5 minutes, the Stop mode will be entered automatically.
- With some televisions, the still picture may be unstable. This is not due to any defect of the unit.

COUNTER MEMORY AND COUNTER/LAP FUNCTIONS

COUNTER/LAP button
To change the display from the Clock mode to the Counter or Lap mode, press this button.
Pressing it once obtains the Counter mode; pressing it again obtains the Lap mode.
The COUNT or LAP indicator will light correspondingly.

RESET button
Press to reset the counter to "0000" for indexing the tape, or to reset the LAP time to "0:00" for checking the elapsed recording time.



CLOCK button
Press this button to change the display from the Lap or Counter mode to the Clock mode.

Counter Memory function

1. Press the COUNTER/LAP button to obtain the Counter mode.
2. Press the RESET button at a point which you may wish to locate later.
   - The tape counter will indicate "0000".
3. Press the COUNTER MEMORY button to ON (▬).
4. Press the REW (or FF) button when you need to return to the designated point.
   The tape will rewind (or fast forward) and stop at about the "0000" counter reading automatically.

Notes

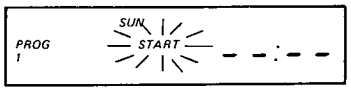
- The LAP time is counted up to 99 hours, 59 minutes.
- Unless the RESET button is pressed in the LAP mode, the count is maintained even after the POWER switch is pressed to OFF (as long as the unit is plugged into an AC outlet).
- When the Lap mode is engaged during playback, counting does not take place, although the current count is displayed.

AUTOMATIC TIMER RECORDING

The built-in 14-day/4-event programmable timer permits recording of selected channels on preset days from preset start times to preset stop times.

10 Press TIMER.
- Before pressing the TIMER button, make sure that a cassette has been loaded.
- The TIMER indicator will light together with the PROG indicator and the numbers of the programmed memories.

4 Press PROGRAM.
- The display will change to the Program Set mode with "PROG 1" lit and "START" flashing; the leftmost channel indicator will also flash, if no channel has been pre-programmed.

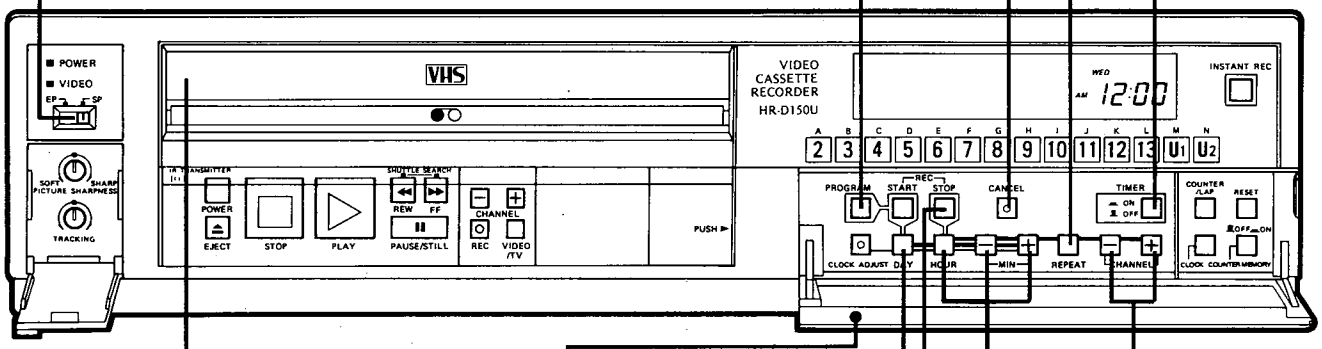


- Now you are ready to enter the data into No. 1 program memory. If you want to change the program number, press the PROGRAM button until the required program number illuminates.

2 Set to SP or EP as required.

REPEAT button

CANCEL button



1 Load a cassette (with safety tab in place); power will be switched on.

3 Open the sub-control panel.

9 Select the channel using CHANNEL - or +.

7 Press REC STOP.
- "STOP" in the display will flash.

6 Set the start time using HOUR and MIN.

5 Press DAY to obtain the required day indication.

8 Set the stop time using HOUR and MIN.

IMPORTANT INFORMATION ON TIMER RECORDING

Setting the START and STOP times

- It is not possible to set the START and STOP times unless the clock time has previously been set.
- Enter the data while the START or STOP indicator is flashing.
- Holding the DAY, HOUR, MIN + and MIN - buttons pressed for more than 1 second continuously advances the indication automatically. Pressing the buttons once advances the indication in single increments only.
- The sequence of day indications: from "SUN" (first Sunday) to "SAT" (first Saturday), then "2nd SUN" to "2nd SAT", and then an everyday indication along with the REPEAT indicator.
- After setting the START time, when the REC STOP button is pressed, initial STOP time indication will be the same as the start time.
- Unless the START time has been properly set, STOP time setting is not possible.
- The STOP time can be set within 24 hours from the START time. If the hour setting for the STOP time runs into the following day, there is no need to set the day (the DAY button does not function when the STOP time mode is engaged). Recording will stop at the preset time on the following day, even though the day indication is not displayed.

Selecting the channel

- In the Program Set mode, one channel indicator is always flashing (initially the leftmost channel indicator).
- Selecting the channel is independent of the REC START or REC STOP button. Therefore, it is possible to select the channel either before or after setting the START and STOP times.
- The currently tuned channel locks in the Program Set mode, and when the display returns to the Clock mode, the indicator of the locked channel lights.

Repeating the programmed data

- When you want to record a daily serial, just obtain the everyday indication when setting the day. The REPEAT indicator will light automatically.
- If you wish to hold the preset data in memory in order for recordings to be made repeatedly according to the same data (for example, at the same time on the same day every week), press the REPEAT button. The REPEAT indicator will light.

Cancelling the preset data

- The preset programs can be cancelled by pressing the CANCEL button. For this purpose, first engage the Program Set mode for the number you wish to cancel and then press the CANCEL button.
- The PROGRAM and CANCEL buttons cannot be pressed simultaneously.

Checking the programmed data

- Checking and re-programming can be performed anytime, even when the TIMER button has already been engaged in the ON position.
- While recording is actually taking place, the STOP time can be changed. If the REC START button is pressed, the START time is displayed, but the START indicator does not flash, indicating that changing of the START time is not possible.
- While recording is actually taking place according to one preset program, all other preset programs can be checked or re-programmed.

TIMER indicator

- When the TIMER button is pressed to ON with a cassette loaded and the timer correctly programmed, the TIMER indicator on the display will light with "PROG" and the corresponding program number also lighting and the power is turned off.
- When you have preset several programs at a time, confirm that all the preset program numbers light together with the TIMER indicator when the TIMER button is pressed. The program whose number does not light has not been correctly preset (for instance, the preset START and STOP times are the same, or no STOP time has been entered). Recheck the programmed data.
- If all programs have been wrongly preset, the TIMER indicator will flash for about 10 seconds when the TIMER button is pressed, and remain lit.
- If the TIMER button is pressed when a cassette is not loaded, the TIMER indicator will continue blinking.
- If a cassette with its safety tab removed has been loaded, it will be ejected automatically when the TIMER button is pressed. The TIMER indicator will continue blinking.
- As long as the TIMER button is in the ON position, loading or unloading of a cassette is not possible.
- To re-load a cassette after the TIMER button is pressed to ON (the POWER indicator turns off), press it once to OFF. Although the POWER indicator remains off, you can load a cassette (the POWER indicator lights). Then press the TIMER button once again to ON.

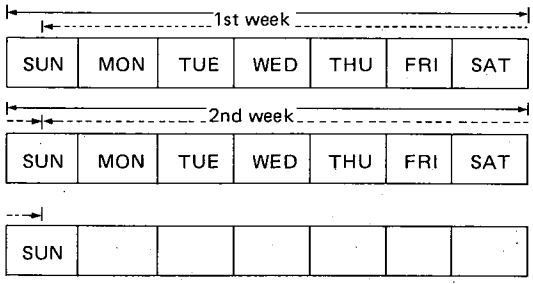
Timer operation

- Tape loading starts 10 seconds before the preset START time and the recording start signal is triggered 2 seconds before the preset time so that recording starts exactly at the preset time.
- During timer recording, the number of the program that is presently operating will be flashing.
- After timer recording, the power is switched off and the auto rewind mechanism does not function. If the end of the tape is reached during timer recording, the cassette is automatically ejected and then the power is switched off.
- After a power failure has occurred (refer to page 8, "Power failure indicator"), all programmed data are cancelled.

Two-week timer

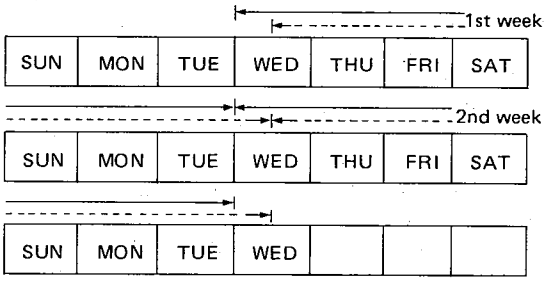
"Two-week" presetting capacity means that you can "reserve" recordings on any one of 14 days in advance including the day of setting.

If the current day of setting is Sunday:



- In this situation, there may be no possibility of confusion in setting the day.
- Namely, the "MON" is Monday of the current week and the "2nd MON" is Monday of the next week. The same applies to other week days.
- Regarding Sunday, there are two different cases; one is that you are going to set the timer to a time before the current time of setting and the other is that the preset time is a time after the current time of setting.
- In the former case, the "SUN" is the next Sunday and the "2nd SUN" is the Sunday after next.
- In the latter case, the "SUN" is the current Sunday and the "2nd SUN" is Sunday of the next week.

If the current day of setting is Wednesday for example:



- Remember that the "MON", "TUE" and so on ... mean the first coming Monday, the first coming Tuesday, and so on, and not Monday of the current week.
- Similarly, the "2nd MON", "2nd TUE" and so on ... are the second coming Monday, the second coming Tuesday, and so on, and not Monday or Tuesday of the next week.
- If you are on Wednesday for example, and wish to record something on Tuesday of the next week, the preset data should be "TUE". To record on Thursday of the next week, set "2nd THU".
- Regarding Wednesday, the same as mentioned about Sunday on the left applies.

4-program timer

"4-program" presetting capacity means that you can have 4 separate program entries which contain different programming data. Because of this capacity, you can even "reserve" 4 different TV programs, either on the same day or on different days.
Each program (No. 1 through No. 4) entry contains information on "TV program channel number", "day", "start time", "stop time" and "either single or repeat.

Example of the contents of one program entry:

Program number	TV program channel number	Day	Start time	Stop time	Repeat
2	12	WED	PM 2:30	PM 3:00	–

Variety of setting possibilities

- You can set for some day of the 1st week or the 2nd week.
- You can set for one day of every week by first setting that day of the 1st week and pressing the REPEAT button.
- You can set for one day of every week starting from the second week by first setting that day of the 2nd week and pressing the REPEAT button.
- You can set for all days. For this setting, obtain the indication "SUN MON TUE WED THU FRI SAT", (the REPEAT indicator lights automatically), and recordings will be repeated at the same time everyday week after week.
- All the above applies for all 4 program entries.

Program priority

- If you have preset two programs for the same day and the same START time, the setting corresponding to the smaller program number has priority.
- If two programs have preset times which overlap, the earlier-started program will be interrupted by the later one.

INSTANT RECORDING

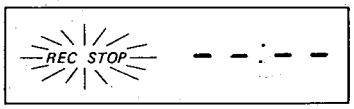
Besides starting and stopping a recording as usual, the HR-D150U offers a more convenient possibility: starting by the push of a single button, and recording will stop automatically after a certain period of time. Use this facility for starting a recording before you go to bed or leave home.

1 Load a cassette.

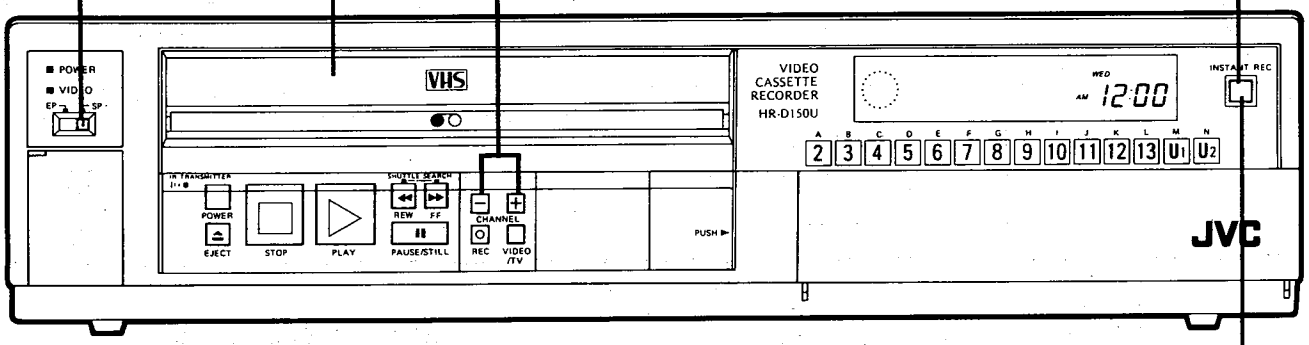
2 Set to either SP or EP as required.

3 Select the channel from which you want to record.

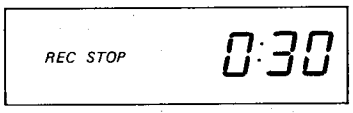
4 Press INSTANT REC.
- The following indication will appear on the display, to show that the recorder is ready to start recording.
- The REC STOP indicator on the display will flash.



Caution:
Never press the INSTANT REC button while a cassette is in the process of being loaded.



5 Press INSTANT REC once again.
- Recording will begin immediately and the following indication will appear on the display, showing that recording will automatically stop and power will switch off after 30 minutes.
- The REC STOP indicator remains lit.

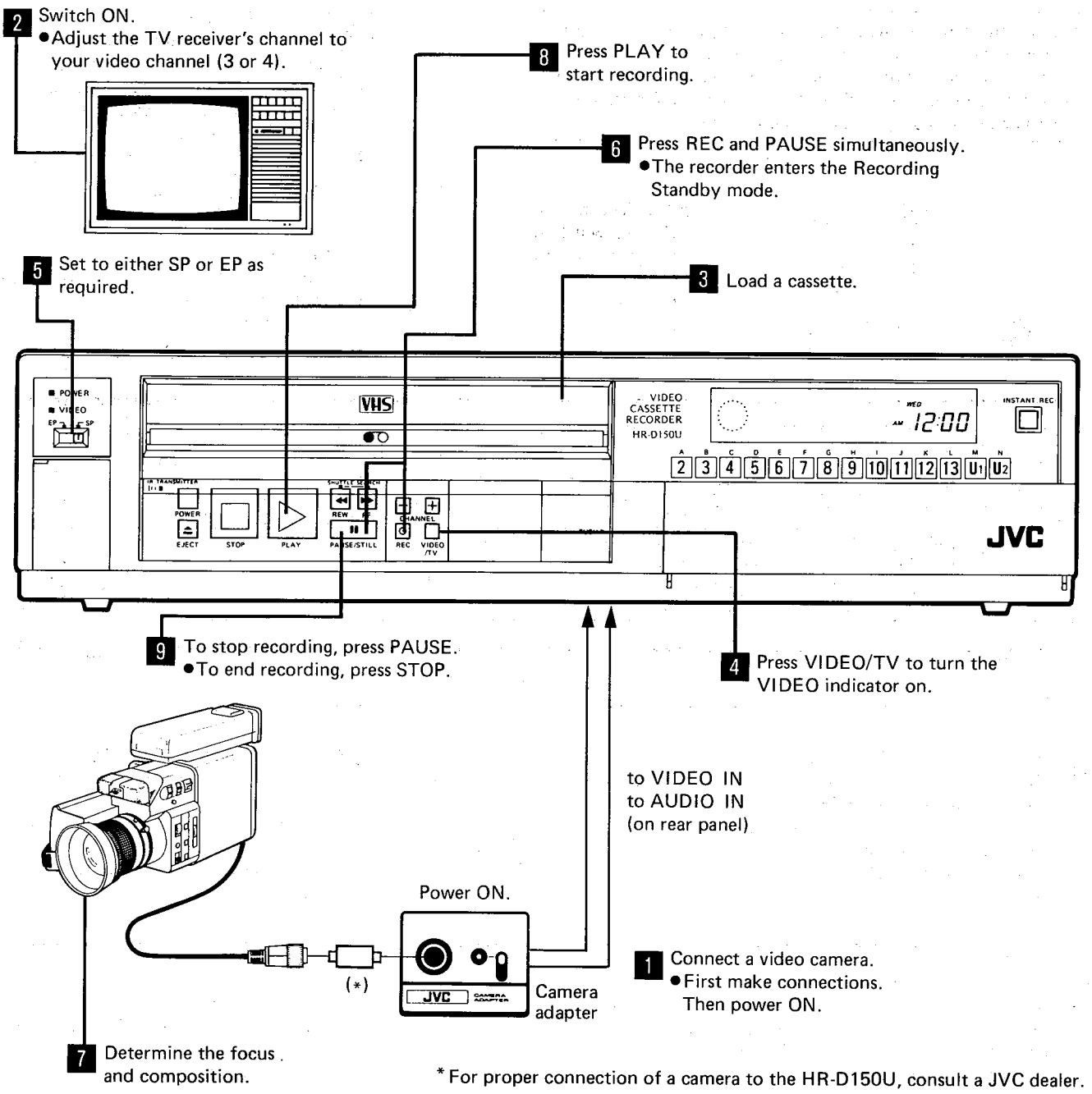


6 Each time the INSTANT REC button is pressed, recording time increases by 30 minutes.
- For a more precise time setting, use the HOUR, MIN + and MIN - buttons to set to the exact time required.

Notes

- If the INSTANT REC button is not pressed a second time within about 10 seconds after it has been pressed once, the Instant Record mode will be cancelled and the display will change back to the Clock mode.
- Time setting in the Instant Record mode is possible up to a maximum of 4 hours when the INSTANT REC button only is used. If the MIN + button is used after 4:00, this setting can be increased up to 4 hours, 59 minutes. If 4:59 is to be obtained, simply press the MIN - button once.
- While recording is in progress, the displayed time counts down; when 0:00 is reached, the Record mode is released after 10 seconds and the power is switched off.
- If you want to stop recording after having started recording in the Instant Record mode, press the STOP button.
- The instant recording function can also be used as a sleep timer. If you press the INSTANT REC button during normal recording, the REC STOP indicator will light on the display and the indication "0:30" will be obtained, showing that recording will stop automatically after 30 minutes. The time span can be adjusted in the same way as for instant recording up to 4 hours, 59 minutes.
- Instant recording has priority over all other modes; you can start recording from any mode using the INSTANT REC button, even from rewind or fast forward.
- The INSTANT REC button functions even when the power is off; pressing it once changes the display to the Instant Record mode and pressing a second time switches the power on and starts recording.
- If the INSTANT REC button is pressed with a non-recordable cassette loaded (one with its safety tab removed), the cassette will be automatically ejected.
- If you want to perform instant recording after you have set the timer and pressed the TIMER button to ON, press the INSTANT REC button as usual. Power will be turned on and instant recording will start. After instant recording has been performed, the Timer mode is automatically re-entered and power is turned off. The preset time for instant recording has priority over the programmed preset times.
- If the programmed START time for a timer recording should come after the STOP time of the instant recording, this timer recording will still be made automatically.

RECORDING WITH A VIDEO CAMERA


2 Switch ON.
●Adjust the TV receiver's channel to your video channel (3 or 4).
8 Press PLAY to start recording.
6 Press REC and PAUSE simultaneously.
●The recorder enters the Recording Standby mode.
5 Set to either SP or EP as required.
3 Load a cassette.
VIDEO CASSETTE RECORDER HR-D150U
INSTANT REC
JVC
9 To stop recording, press PAUSE.
●To end recording, press STOP.
4 Press VIDEO/TV to turn the VIDEO indicator on.
to VIDEO IN
to AUDIO IN
(on rear panel)
Power ON.
(*)
Camera adapter
1 Connect a video camera.
●First make connections. Then power ON.
7 Determine the focus and composition.

* For proper connection of a camera to the HR-D150U, consult a JVC dealer.

Notes

- The camera's start/stop button has no effect. Always use recorder's controls to start or stop recording.
- If feedback noise (whistling or howling) is heard from the TV receiver, reduce the volume or move the microphone, being used, farther away from the TV receiver.
- For camera operation refer to the instruction manual for the relevant camera.
- Monitoring the playback picture on the camera's electronic viewfinder is not possible.
- Be sure to unplug the cables from the VIDEO IN and AUDIO IN connectors after camera recording, otherwise TV recording is not possible.

IN CASE OF DIFFICULTY

What may initially appear to be trouble is not always a real problem. Make sure first . . . . .

Symptoms		Check points
No power is applied to the HR-D150U.		• Is the power cord disconnected? Connect it.
Playback picture does not appear while the tape is running		• Is the TV receiver's channel selector set to an occupied channel? Set to channel 3 or 4 (your VIDEO CHANNEL).
Tape does not run in the Record mode.		• Is the PAUSE/STILL button pressed? Press PLAY to release.
REC button cannot be engaged.		• Is the cassette improperly loaded? Load it properly. • Is the safety tab broken? Reseal the slot.
Tape stops in the Rewind or Fast Forward mode.		• Is the COUNTER MEMORY button set to ON? Set to OFF.
Tape will not rewind.		• Is the tape already rewound to the end?
TV broadcasts cannot be recorded.		• Is equipment connected to the VIDEO IN and/or AUDIO IN connectors? Disconnect it.
Noisy playback picture.		• Adjust with the TRACKING control. Return the control to its center position after playing back the particular tape.
Pressing PAUSE/STILL during still playback brings a still picture (in a frame-by-frame manner) with noise bars.		• Noise bars can be eliminated by pressing the PAUSE/STILL button a few more times.
"Snowy picture" on screen when viewing TV programs while recording another program.		• Is the VIDEO indicator lit? Press the VIDEO/TV button so that the indicator extinguishes.
Detachable control panel does not function.	When attached to the recorder	• Is the panel correctly attached? • Are the terminals clean? If not, wipe them clean.
	When used as a remote control unit	• Are you too far from the recorder? Effective distance is about 8 m (26 ft). • Is there something obstructing the beam? Remove obstacles. • Are the batteries charged? If discharged, replace them. • Are the batteries correctly installed? Check the polarity.

This recorder contains microcomputers. External electronic noise or interference could cause malfunctioning. In such cases, switch the power off and unplug the power cord. Then plug it in again and check the functions.

HEAD CLEANING

- Picture playback may become blurred or interrupted while the TV program received is clear. This does not mean that the recorded program has been erased.
- Dirt accumulated on the video heads after long periods of use causes such problems. In this case, head cleaning requiring highly technical care is necessary.

For head cleaning, consult the nearest JVC Service Dealer.

SPECIFICATIONS

Format		: VHS standard
Recording system		: Rotary, slant azimuth two-head helical scan system with two pairs of video heads, one pair exclusively for the SP mode and one pair for the EP mode.
Video signal system		: NTSC-type color signal
Tape width		: 12.65 mm (1/2 inch)
Tape speed	(SP)	: 33.35 mm/s (1-5/16 ips)
	(EP)	: 11.12 mm/s (7/16 ips)
Maximum recording time	(SP)	: 160 min. with JVC T-160 video cassette
	(EP)	: 480 min. with JVC T-160 video cassette
Temperature		
Operating		: 5°C to 40°C (41°F to 104°F)
Storage		: -20°C to 60°C (-4°F to 140°F)
Antenna	(VHF)	: 75 ohms, unbalanced
	(UHF)	: 300 ohms, balanced
Channel coverage		
	(VHF)	: Channels VL 2 – 6 VH A – I 7 – 13 J – W
	(UHF)	: Channels 14 – 83
VHF output signal		: Channel 3 or 4 (switchable; preset to channel 3 when shipped) 75 ohms, unbalanced
Power consumption		: 28 watts
Power requirement		: AC 120 V∿, 60 Hz
Video		
Input		: 0.5 to 2.0 Vp-p, 75 ohms, unbalanced
Output		: 1.0 Vp-p, 75 ohms, unbalanced
Signal-to-noise ratio		: 45 dB (Rohde & Schwarz noise meter) with PICTURE SHARPNESS control at center position
Horizontal resolution		: 240 lines with PICTURE SHARPNESS control at center position
Audio		
Input		: Line: -8 dBs 50 k-ohms, unbalanced
Output level		: -6 dBs, high impedance load
Output impedance		: Less than 1 k-ohm, unbalanced
Signal-to-noise ratio		: More than 40 dB
Frequency range		: 70 Hz to 10,000 Hz
Timer		: 14-day/4-event timer
Dimensions		: 435 mm(W) x 105 mm(H) x 376 mm(D) (386 mm with control panel attached) (17-3/16" x 4-3/16" x 14-13/16") (15-1/4" with control panel attached)
Weight		: 7.6 kg (16.8 lbs)
Provided accessories		: Infrared remote control unit (detachable control panel) "AAA" battery x 2 Channel number film Antenna cable (F-type) Matching transformer Screwdriver for band selector

Specifications shown are for SP mode unless otherwise specified.
Design and specifications subject to change without notice.

SECTION 1
GENERAL DESCRIPTION

1.1 MAIN FEATURES

1. Separate sets of rotrary heads are used for the standard (SP) mode and extended play (EP) mode. This design allows high picture quality during slow speed (up to 8 hours) operation.
2. Infrared remote control detaches from the mainframe.
3. Automatic Editing Function (AEF) utilizes a back-space system for smooth transitions between separately recorded program segments.
4. The shuttle search feature functions in both forward and reverse playback directions. Speed in SP and LP modes is approximately 7 times that of the normal playback speed.
   During shuttle search, the phase lock system stabilizes noise appearing in the picture, while sound is muted.
5. 14-day/4-event programmable timer.
6. The fluorescent display panel (FDP) uses symbolic mode indicators for easy recognition of the mode in progress.
7. The instant recording function can be set for up to 4 hours 59 minutes.
8. Lap indicator shows the elapsed recording time.

1.2 MECHANISM CONTROL OPERATIONS

1.2.1 Mechacon operations

1. POWER ON

The power ON state allows a cassette to be inserted and removed. In this state, the POWER LED lights and all machine operation are enabled.

1) POWER ON/OFF can be also set from the remote control unit. At this time, the TIMER button must be OFF.

2. INITIAL OPERATIONS AFTER POWER ON

1) In absence of a cassette, all mode indicators are OFF and the signal system enters the E-E mode.
2) With a cassette present, if both the CASSETTE LOAD END switch and the EJECT END switch are off, the eject mode is entered.
3) When the machine is in modes other than STOP, after unloading, the stop mode is entered.

3. POWER OFF

In the POWER OFF state, the front panel POWER LED indicator is extinguished and all operations, are inhibited except cassette insertion and removal.

The power OFF state is attained by:

1) Setting the front panel POWER button to OFF or setting power off from the remote control unit. In modes other than STOP, unloading is performed, then power OFF.
2) Setting the front panel TIMER button to ON. When this is performed during playback or recording the mechanism first enters the TIMER mode, then proceeds to POWER OFF. During instant recording, POWER OFF is not produced.
3) The above cases apply when the safety tab of the cassette is present. If the cassette tab is absent, the cassette is ejected.

4. AUTO-STOP MODE ENTRY

1) When beginning of tape is reached in REWIND or SEARCH REVERSE mode. The leader portion of the tape is detected, at which time the tape is transported in the forward direction until the leader tape clears the detector, then the STOP mode is entered.
2) Counter memory switch ON in Fast Forward or Rewind mode, and the tape counter reaches "0000" indication.
3) If the PAUSE/STILL mode continues for longer than 5 minutes 25 seconds.
4) During PLAYBACK, RECORDING or SEARCH FORWARD mode, if the take-up reel disk rotation stops for longer than approximately 4 seconds.
5) Drum motor rotation stops for longer than approximately 2.5 seconds in the PLAYBACK, RECORD, PAUSE, STILL or SEARCH mode.

5. AUTO-EJECT MODE ENTRY

1) If cassette loading operation is not completed within about 8 seconds.
2) START and END SENSORS are activated simultaneously.
3) If the safety tab is absent from the cassette and INSTANT RECORDING button pressed, Eject is performed.

6. AUTO-REWIND MODE ENTRY

1) At end of tape in the PLAYBACK, RECORD, SEARCH FORWARD or FAST FORWARD mode.

7. AUTOMATIC POWER ON or OFF

1) In the POWER and TIMER OFF state, after ejecting a cassette, power is switched off.
2) In the POWER and TIMER OFF state, inserting a cassette switches power on.
3) If EJECT operation is not completed within approximately 8 seconds, power is switched off.
4) If tape loading operation is not completed within approximately 8 seconds, power is switched off.
5) If tape unloading operation is not completed within approximately 8 seconds, power is switched off.
6) At completion of INSTANT RECORDING, unloading is performed, then power is switched off.
7) When end of tape is reached in TIMER or INSTANT RECORDING, EJECT is performed, then power is switched off.

8) If the safety tab is absent from the cassette and the TIMER button is pressed, Eject is performed then power is switched off.
9) In the event of power failure, at the return of power, unloading is performed and power switched off.
If this occurs during TIMER RECORDING, unloading is performed, then the RECORDING mode is entered.

8. TIMER MODE
1) 10 seconds prior to TIMER RECORDING, power is switched on, then the PAUSE mode is entered. Recording starts 2 seconds before the programmed time.
During TIMER RECORDING, all operating controls are inhibited except INSTANT RECORD.

9. INSTANT RECORDING
1) With power button ON and safety tab of cassette present, the INSTANT recording command is registered regardless of the mode in progress.

Table 1-2-1 shows the allowed shifts from a mode in progress to another mode.

MODE / KEY	STOP	PB	PAUSE STILL	FF	REW	REC	REC PAUSE	INSTANT REC	TIMER REC
STOP		O	O	O	O	O	O	O	X
PB	O		O	O	O		O (REC)	X	X
PAUSE/STILL	X	O	O (FADV)	X	X	O (REC PAUSE)		X	X
FF	O	O (S.FF)	O (S.FF)		O	X	X	X	X
REW	O	O (S.REW)	O (S.REW)	O		X	X	X	X
REC/PB	O	O	O	O	O		O	X	X
REC PAUSE	O	O	O	O	O	O		X	X
EJECT	O	O	O	O	O	X	X	X	X
INSTANT REC	O	O	O	O	O	O	O	O (*1)	O
CHANNEL UP/DOWN	O	X	X	O	O	X	O	X	X

Notes: O : Enabled (Mode changes.)
X : Inhibited (Mode does not change.)

*1 : Rec time advance

Table 1-2-1

1.3 DISPLAY/TIMER SECTION

Inspection Item	Conditions	Operation
1. Power Interrupt Display	1) Connect to AC power.	Power interruption is indicated by blinking [SUN AM 12:00].
	2) Press the CLOCK ADJ button.	Power interrupt display is released (blinking stops).
	3) In above (1) state, with the TIMER switch ON, press the CLOCK ADJ button.	Power interrupt display is not released (blinking continues).
2. Time Setting	1) Press the CLOCK ADJ button.	Power interrupt display is released (blinking stops). Seconds count begins when the CLOCK ADJ button is released.
	2) Hold the CLOCK ADJ button button depressed and press the DAY button.	The day display increments each time the DAY button is pressed.
	3) Hold the CLOCK ADJ button depress the H+ button.	The hour display increments each time the HOUR button is pressed.
	4) Hold the CLOCK ADJ button depressed and press the M+ or M− button.	The minute display increments or decrements each time the M+ or M− button is pressed.
	5) DAY, HOUR, M+ and M−setting sequence.	Setting is enabled regardless of sequence.
	6) Automatic increment or decrement	Display increments or decrements automatically when the DAY, HOUR, M+ or M− button is held depressed for longer than 1 second.
3. Program Setting	1) Press the PROGRAM button.	Program No. 1 is displayed. The program number increments each time the button is pressed. The START indication blinks and the display reads − : − or the previously set start time.
*Start time setting	2) Press the DAY button. (To change from End to Start, press the START button.)	Each time the button is pressed, the day display increments in the sequence SUN through SAT, 2nd week SUN through SAT, all days displayed (daily setting), then this cycle repeats.
	3) Use the HOUR, M+ and M− buttons to set the start time.	Confirm that hours and can be set.
*End time setting	4) Press the STOP btton.	The STOP display blinks and the previously set end time is indicated.
	5) Use the HOUR, M+ and M− buttons to set the end time.	If no end time has been previously set, the start time is indicated.
*Channel setting	1) Use the CH+ and CH− buttons to set the channel.	The CH LED blinks and the channel shifts each time CH+ or CH− button is pressed. (The LED does not blink during channel shift.)
*Weekly setting	1) Press the REPEAT button.	The Weekly display lights when the button is pressed once, and extinguishes when the button is pressed again.
*Program cancel	1) Press the CANCEL button.	The initial display is returned (SUN − : −).

Inspection Item	Conditions	Operation
4. Program Mode Release	1) Press the CLOCK button. 2) Press the COUNT/LAP button. 3) Press the INS REC button. 4) Do not press any button for 1 minite.	Confirm that selected mode is intered. – Same as above – – Same as above – Confirm that the clock mode is returned.
5. Program Number Display and Error Message	1) Without inserting a cassette, set the TIMER switch to ON. 2) Insert a cassette which has the erase protector tab broken off. 3) Insert a cassette which has the erase protector tab present.	The TIMER display blinks to serve as the Error Message. Error Message is produced and Eject performed. If at least one program has been set, the TIMER indication lights and the program number is displayed. If no programs have been set, after 8 seconds, the TIMER indication blinks.
6. Pregram Execution	1) Insert a recordable cassette and set for recording a program. 2) Set the TIMER switch to ON. 3) Supply a signal to the AUX	 Ten seconds prior to the start time, mainframe power is switched on and the REC PAUSE mode is Entered. Two seconds before the start time, the PAUSE mode is released and recording begins. Confirm that the external signal is recorded.
7. INS REC Setting	1) Insert a recordable cassette and press the INS REC button. 2) Press the INS REC button, then press it again before 10 seconds elapse. 3) Use the HOUR, M+ and M– buttons to further set the recording time.	The Recording End time blinks and – : – is displayed. If no further action is taken, the CLOCK display is returned after then seconds. The Recording End display lights steadily, 0:30 is indicated and the Recording mode is entered. Afterwards, each pressing of the INS REC button increases the recording time by 30 minutes. After reaching 4:00, the next pressing yields 0:00. Confirm that a maximum of 4:59 can be set (the – : – display is not returned during this process).
8. INS REC Checks	1) End of INS REC 2) Tape runs out during INS REC. 3) Cancel INS REC in progress. 4) Erase protect tab is missing from cassette when INS REC button is pressed.	Ten seconds after the INS REC count decrements to 0:00, the INS REC mode is released and the mainframe power is switched off. The INS REC mode is released. Press the tape STOP button to release the INS mode. Confirm that cassette is ejected.
9. CLOCK Button	1) Press the CLOCK button.	Confirm Clock display.

Inspection Item	Conditions	Operation
10. COUNT/LAP Button	1) Press the COUNT/LAP button.	Count and Lap displays alternate each time the the button is pressed.
11. Counter Checks	1) During counter display, operate FF and REW. 2) Set the count MEMORY switch ON and operate FF and REW. 3) During counter display, press the RESET button.	Confirm than the display increments during FF and decrements during REW. Confirm that tape stops when the count reaches 0000 (±2). Confirm than the counter display resets to 0000.
12. LAP Checks	1) Set for LAP indication and perform recording in the REC mode. 2) During LAP display, press the RESET button.	Confirm that the recording time in hours and minutes every minute (up to maximum of 99:59). Confirm that the LAP display is reset to 0:00.
13. CH LED	1) With power ON, press the CH+ or CH– button. 2) With power ON, hold the CH+ or CH– button depressed. 3) With power ON, perform the above operations by using the remote control unit.	Confirm that the LED display shifts with each pressing of the button. Confirm automatic shift when the button is held depressed for longer than one second. Confirm the above.

1.4 GRAPHIC INDICATIONS

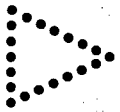
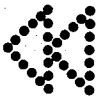
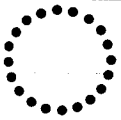
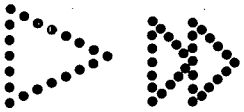
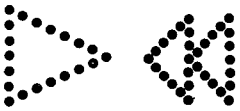
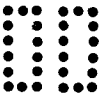
Inspection Item	Conditions	Operation
1. PLAY Indication	Set for Play mode.	
2. FF Indication	Set for FF mode.	
3. REW Indication	Set for REW mode.	
4. REC Indication	Set for REC mode.	 (Circle is red color.)
5. REC PAUSE Indication	Set for REC PAUSE mode.	
6. FF Search Indication	While the Play mode is in progress, press the FF button.	
7. REW Search Indication	While the Play mode is in progress, press the REW button.	
8. PLAY PAUSE Indication	While the Play mode is in progress, press the PAUSE button.	
9. STOP Indication	Press the STOP button to stop tape transport.	(No lighted graphic)

Table 1-4-1

SECTION 2
MECHANICAL ADJUSTMENTS

2.1 GENERAL

2.1.1 Precautions

- IMPORTANT

1. Disconnect from power before removing or soldering components.
2. The tape transport mechanism has been precisely adjusted at the factory and ordinarily does not require re-adjustment.
3. Tighten the screws carefully to avoid damage to the chassis.

Test equipment required :

Color television or monitor
Oscilloscope : wide-band, dual trace, triggered, delayed sweep

Recording tape
Alignment tapes

2.1.2 Required jigs and tools

For proper mechanical adjustment, the following jigs and tools are strongly recommended. Without them, a long trial-and-error period would be necessary, resulting in possible damage. In addition, general-purpose tools and a metric hex key (obtain locally) are required.

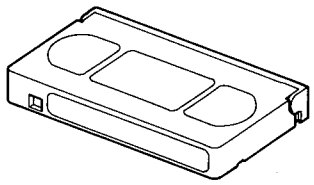
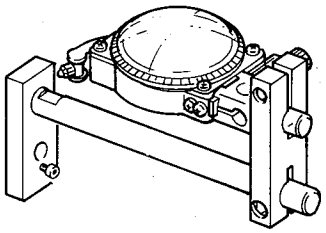
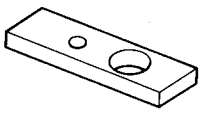
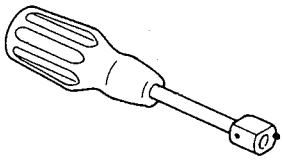
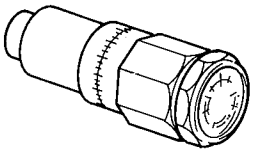
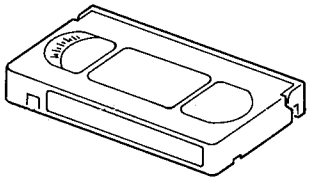
JVC alignment tape MH-1/MH-1L/MH-1M 	Micro-checker PUJ49712-2 	Spacer PUJ44905 (for micro-checker) 
A/CTL head position tool PUJ47351-2 	Torque gauge ass'y PUJ48075-2 (Torque meter : 600ATG, Torque gauge head : PUJ48016-2) 	Back tension cassette gauge PUJ48076 

Table 2-1-1 Jigs and tools

2.1.3 Disassembly

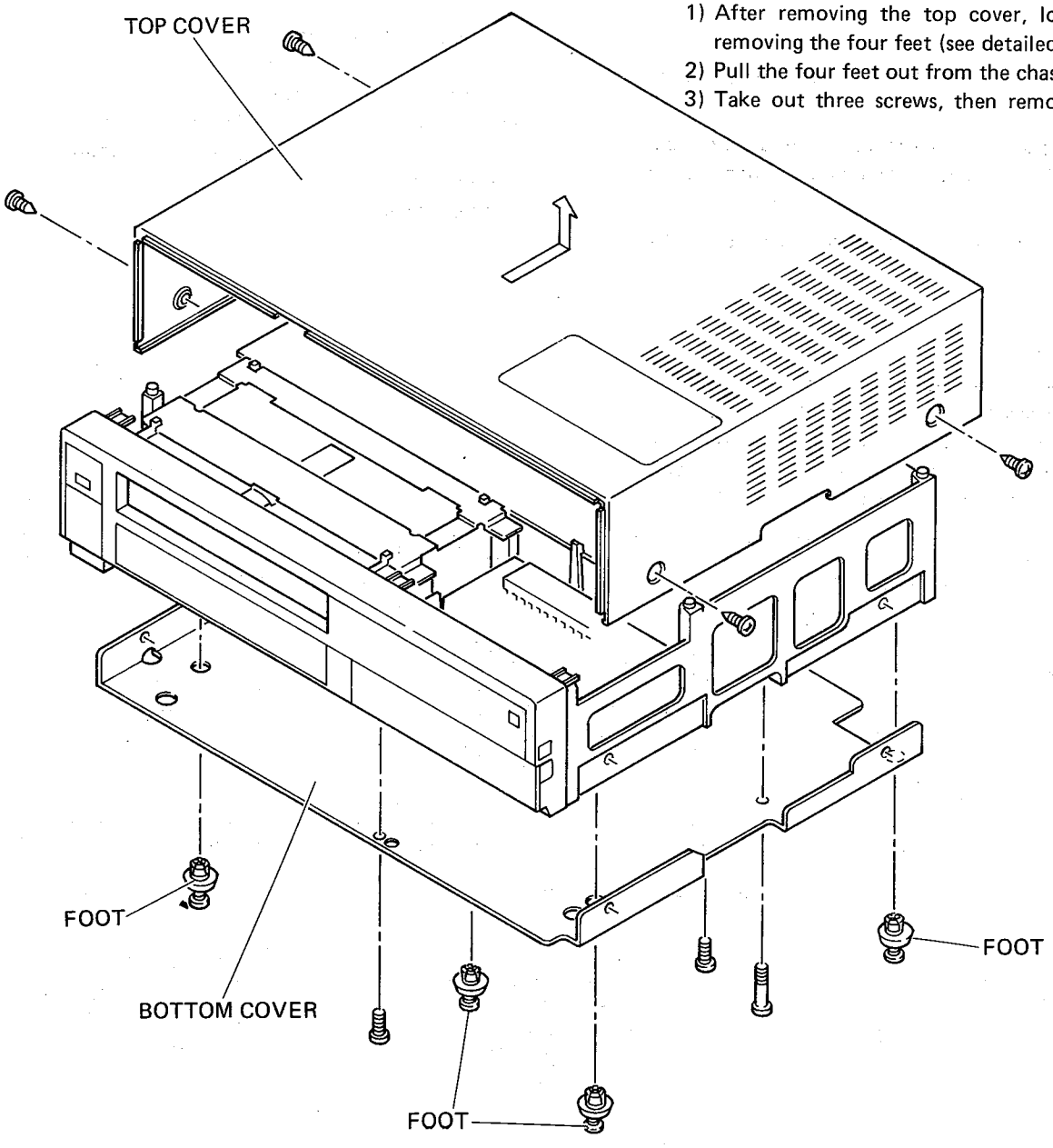
1. Top cover and bottom cover

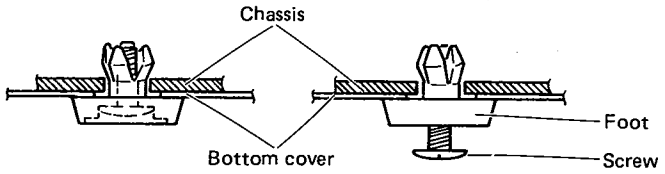
– Top cover –

1) Take out four screws, then remove the top cover to the arrow direction.

– Bottom cover –

1) After removing the top cover, loosen four screws for removing the four feet (see detailed firures).
2) Pull the four feet out from the chassis.
3) Take out three screws, then remove the bottom cover.





Foot is fixed on the chassis Foot is able to remove

Fig. 2-1-1 Top cover/bottom cover

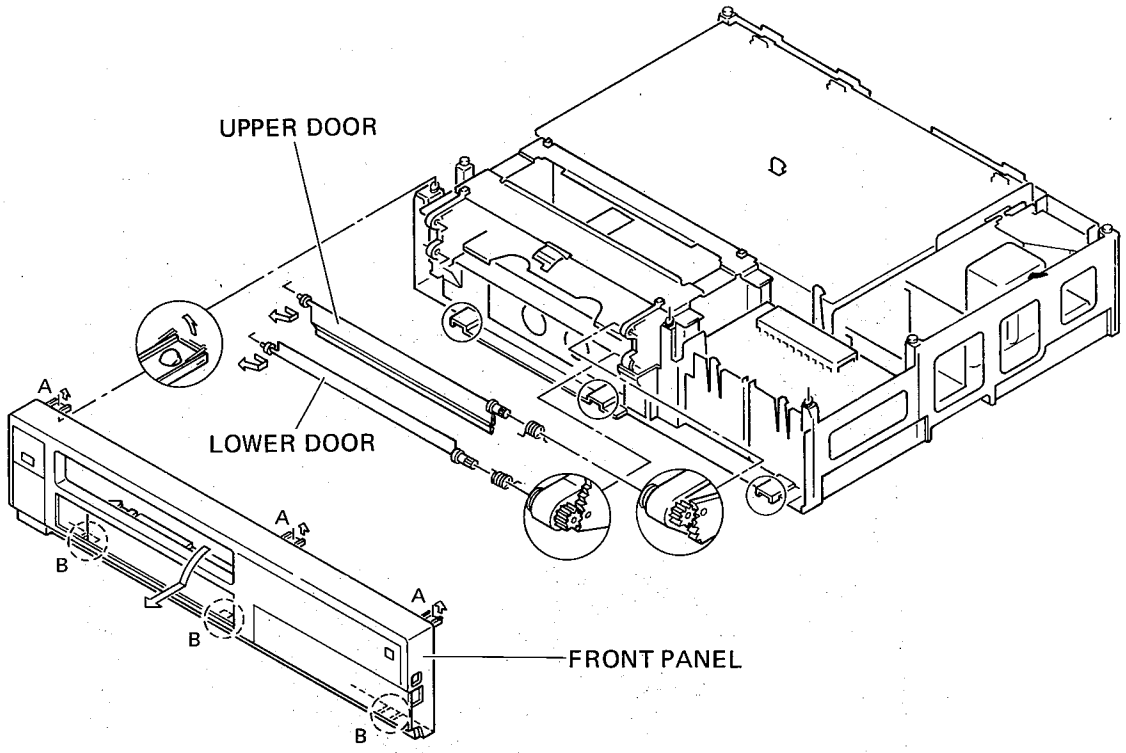
2. Front panel and cassette doors

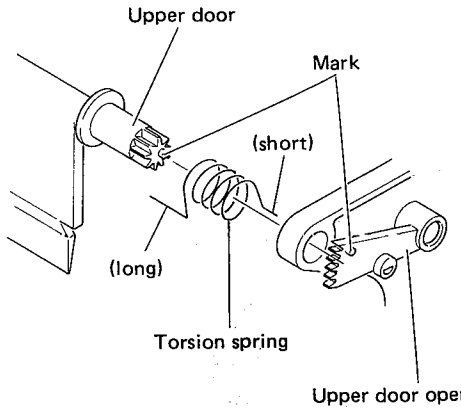
– Front panel –

1) After removing the top cover, bend three points A of the front panel upwards to disengage them from the chassis, then pull the front panel outwards.
2) Disengage three points B of the front panel from the chassis for removing the front panel.

– Cassette doors –

1) Move the lower door fully to the right, then disengage the left end of the lower door from the cassette housing.
2) Pull the lower door out to the left. Use care regarding the torsion spring.
3) Remove the upper door in the same manner as the lower door.





Notes:

When reassembling the doors, proceed as follows:

1) Locate the mark on the gear portion of the upper door.
2) Set the long straight part of the torsion spring toward the upper door.
3) Install the upper door so that the mark noted in Step 1) is aligned with the mark on the upper door opener of the cassette housing.
4) Install the lower door in the same manner as the upper door.

Fig. 2-1-2 Front panel/cassette doors

2.2 PERIODIC MAINTENANCE

The following procedures are recommended for maintaining optimum performance and reliability of this video cassette recorder.

2.2.1 Layout of maintenance parts

1. Top view

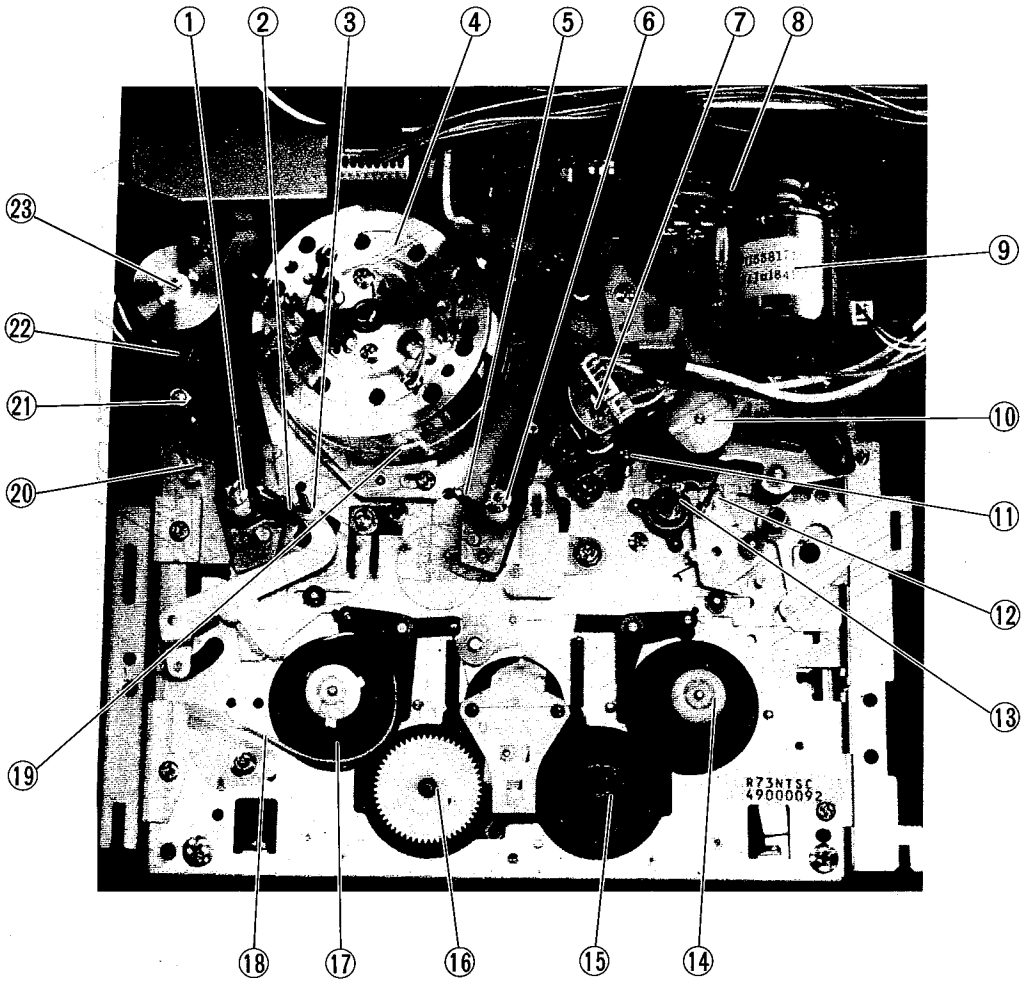


Fig. 2-2-1 Top view

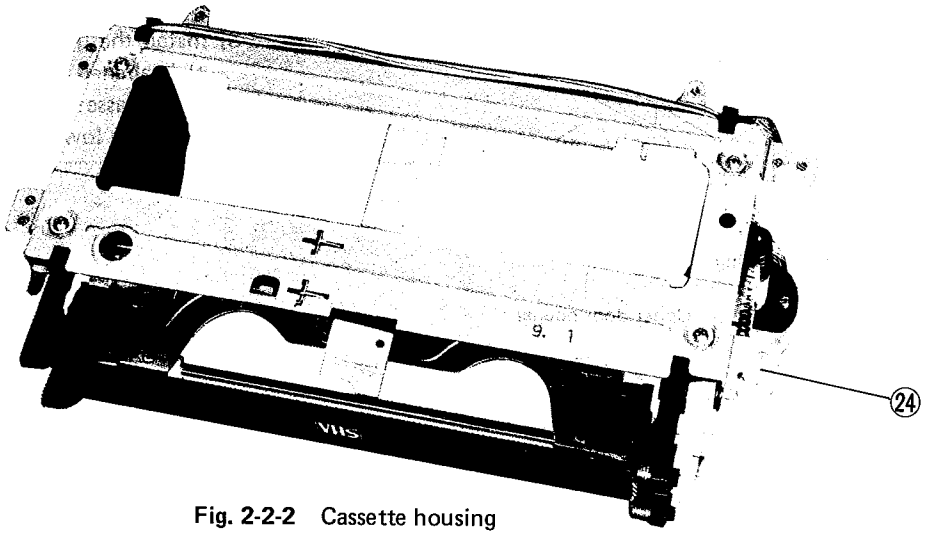


Fig. 2-2-2 Cassette housing

2. Bottom view

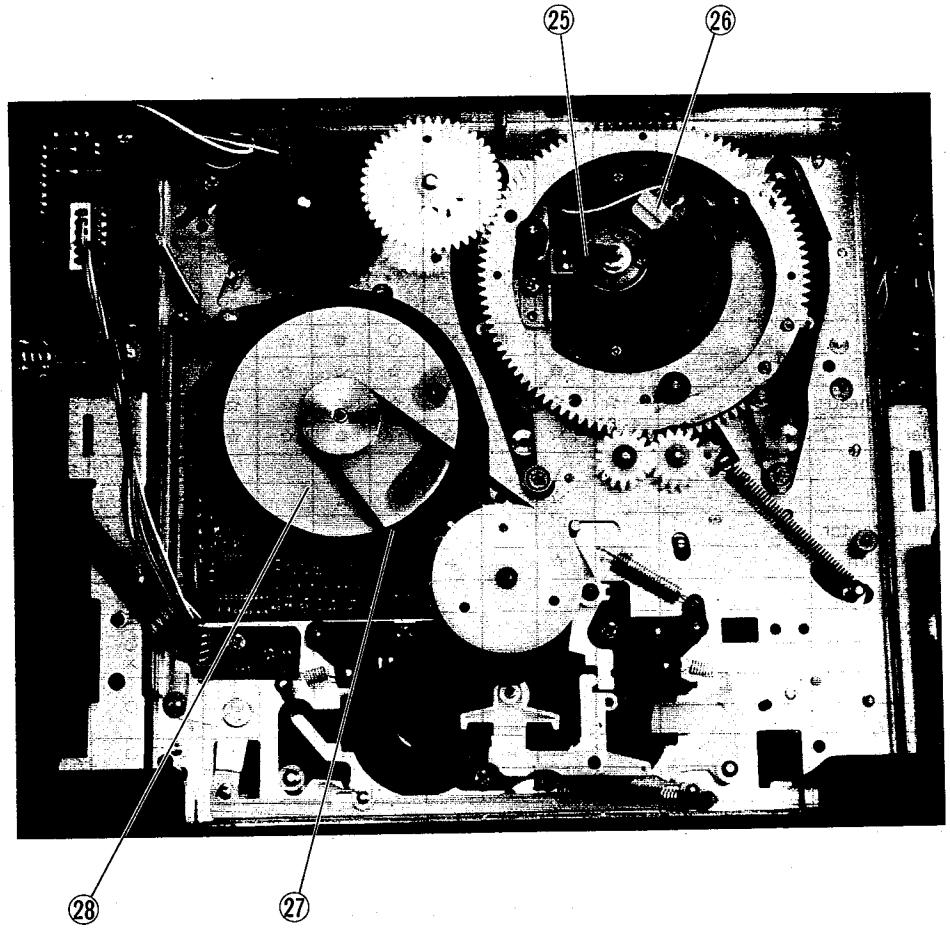


Fig. 2-2-3 Bottom view

1 SUP guide roller
2 SUP slant pole
3 Tension pole
4 Upper drum
5 T.U. slant pole
6 T.U. guide roller
7 Audio/Control head
8 Motor control belt
9 Mode control motor
10 Pinch roller
11 T.U. guide pole
12 Guide arm
13 Capstan
14 T.U. reel disk
15 T.U. clutch
16 SUP clutch
17 SUP reel disk
18 Tension band
19 Lower drum
20 SUP guide pin
21 SUP guide pole
22 Full erase head
23 Impedance roller
24 Cassette motor
25 Brush
26 Pick-up head
27 Reel belt
28 Capstan motor

T.U. : Take-up
SUP : Supply

2.2.2 Service schedule for main components

The following table lists the parts which should receive periodic servicing at the recommended intervals.

	Part Name	Replacement Part No.	Periodic Service Schedule (Operating Hours)										Reference Section	Remarks
			500	1000	1500	2000	2500	3000	3500	4000	4500	5000		
Tape transport system	Tension pole SUP slant pole SUP guide roller SUP guide pin SUP guide pole Impedance roller TU guide pole Capstan Guide arm TU guide roller TU slant pole Lower drum		☆	☆	☆	☆	☆	☆	☆	☆	☆	☆		• For cleaning, use a lint-free cloth or gauze dampened with alcohol. • After cleaning with alcohol, allow the parts to dry thoroughly before using a cassette tape.
	Upper drum		☆	○	●	☆	○	●	☆	○	●	☆	2.3.2	— When cleaning the head tips on the upper drum, do not clean them with a vertical stroke. Use only a gentle back and forth motion in the direction of the tape path.
	Full erase head		☆	☆	☆	☆	☆	☆	☆	☆	☆	○	2.3.3	
	Audio/control head		☆	☆	☆	☆	☆	●	☆	☆	☆	☆	2.3.4	
	Pinch roller		☆	☆	☆	☆	☆	●	☆	☆	☆	☆	2.3.5	
Drive system	Capstan motor											○	2.3.6	
	Reel belt			☆		●		☆		●		☆		
	Mode control motor											○	2.3.7	
	Mode control belt			☆		●		☆		●		☆		
	Cassette motor											○	2.3.8	
	SUP reel disk					△				△		○	2.3.9	— Do not over lubricate.
	TU reel disk													
	TU clutch			○		○		○		○		○	2.3.10	— Torque check (refer to section 2.4.3).
	SUP clutch													
Others	Brush		☆	☆	☆	☆	☆	☆	☆	☆	☆	○	2.3.11	
	Tension band			○		○		○		○		○	2.3.12	— Back tension check (refer to section 2.4.4)
	Pick-up head												2.3.13	

☆ Cleaning ● Replacement △ Lubrication ○ Check and Replace if necessary.

Table 2-2-1 Standard service periods

Above replacement times will vary greatly according to environmental and usage conditions. Routine inspection and maintenance are also important factors that influence the unit life. Note that rubber parts may become aged or deformed after long periods of storage, even if the unit is not used.

Note: Even if the unit is not used frequently, cleaning, lubrication and replacement of the belts should be undertaken every 2 years.

2.3 MAIN ASSEMBLY REPLACEMENT

Remove the external covers and the circuit boards, as necessary, to allow replacement.

2.3.1 Cassette housing

- Removal of cassette housing

1. Take out screws (1) and disengage two stoppers from MAIN board, then raise MAIN board upwards.
2. Disconnect connector CN1, coming from the MAIN board, from the CASS. HOUSING board.
3. Take out four screws (2) and remove the earth plate.
4. Carefully lift the cassette housing upwards to remove it.

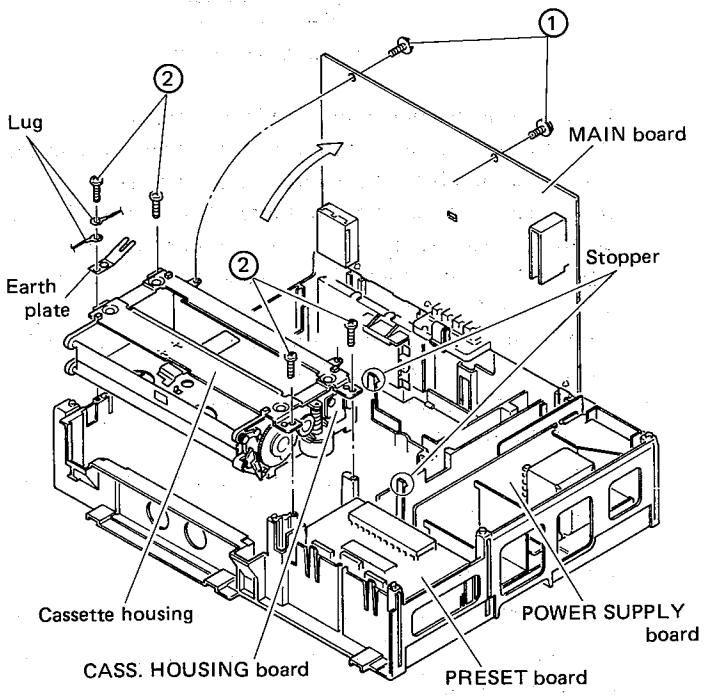


Fig. 2-3-1 Removal of cassette housing

- How to operate the set without loading a tape cassette

For service procedures that call for operation of the set without loading the tape around the head drum, extract the cassette housing from the interior of the set and position it as described below.

1. Set a sheet of insulated material (cardboard, plastics, etc.) on the right side of chassis, above the PRESET and POWER SUPPLY boards.
2. Remove the cassette housing from the interior of the set and place it on the insulated sheeting, but do not disconnect the connector from the MAIN board.
3. Insert a cassette into the cassette housing. The housing mechanism functions to retract the cassette.

Notes:

1) Before inserting the cassette, put two lugs (shown in Fig. 2-3-1) into electric connection.
2) To prevent alignment tape from miss-erasure, insert the cassette without safety tab into the cassette housing.
3) Confirm that the cassette is not in tape end or tape start position.

4. Since the required sensors are contained within the housing, after the cassette has been retracted, the desired modes can then be obtained by using the operation switches.

2.3.2 Upper drum

1. Unsolder the twelve wires connecting the lower drum from the relay pins of the upper drum (perform quickly to avoid damaging the wires).

RELAY PIN COLOR	CHANNEL	INNER/OUTER
Brown	SP, CH-1	Brown/Green
Red	SP, CH-2	Red/White (Clear)
Blue	EP, CH-1	Blue/Black
Orange	EP, CH-2	Orange/Yellow

Table 2-3-1 Upper drum wiring

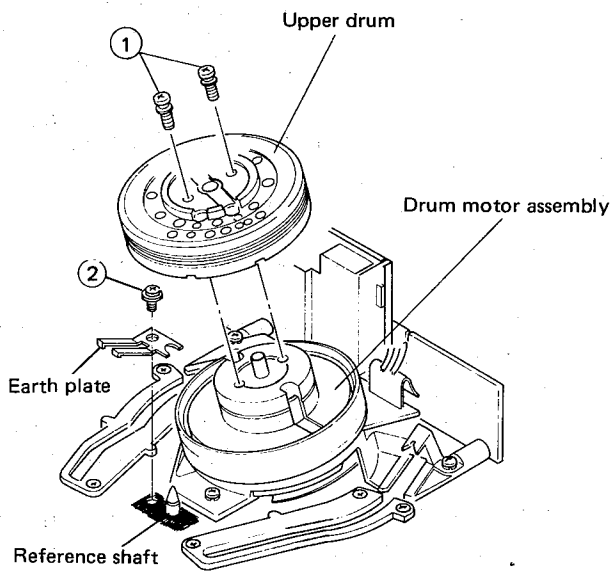


Fig. 2-3-2 Upper drum replacement

2. Take out two screws (1) and remove the upper drum in the upward direction.
3. Use alcohol to clean the lower face of the new upper drum and the upper face of the lower drum. When handling and installing the new upper drum, avoid directly touching the head tips and use care not to scratch the drum.
4. Reassemble by reversing the above steps. When resoldering, observe the correct channels (refer to Table 2-3-1) and avoid overheating the wires.

5. Perform the upper drum eccentricity adjustment.
   1) Supply power and set for the Play mode without a cassette housing (refer to section 2.3.1). After completion of loading, disconnect from power.
   2) Take out screw (2) and remove the earth plate as shown in Fig. 2-3-2.
   3) Set the micro-checker on the reference shaft as shown in Fig. 2-3-3. Use the accessory hex wrench (metric) to tighten the fixing screw.

   Caution: The micro-checker is a test fixture for measuring eccentricity of the upper drum.
   When using this fixture, observe the following precautions.

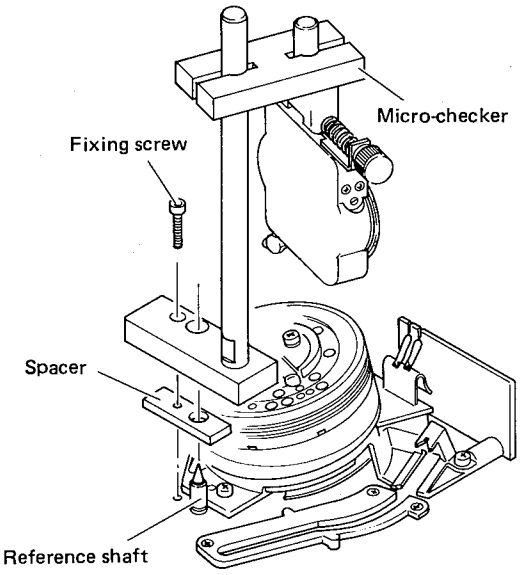


Fig. 2-3-3 Micro-checker mounting

- **As the instrument is extremely precise, use special care not to drop it or subject it to strong vibration.**
- Do not apply strong force to the test probe.
- The outer frame of the scale can be turned about 7 scale divisions. Do not turn it forcibly (force greater than 300 g-cm).
- **Use care that the jig does not contact the video heads.**
- Before mounting, turn the fine adjust knob counter clockwise (to where the spring tension is no longer felt).
- **Do not apply power while the jigs are installed.**

   4) Check and readjust the micro-checker position. The correct position is:
- The test probe contact point is 2 or 3 mm under the top of the upper drum.
- The test probe movement direction is toward the center portion of the upper drum.

   5) Gradually turn the fine adjust knob clockwise so that the test probe contacts the upper drum. The dial indicator registers zero on the scale.
   6) While using care not to apply lateral pressure to the upper drum, slowly turn the upper drum and read the deviations indicated by the micro-checker.

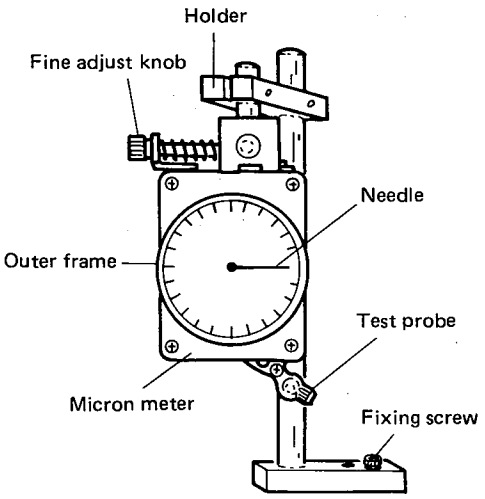


Fig. 2-3-4 Micro-checker

   7) Check for needle deflection within 4 microns.
   8) If deviation is greater than 4 microns, after turning the fine adjust knob counterclockwise to disengage the test probe from the upper drum, loosen two screws (1) and carefully readjust the upper drum position, then retighten the two screws in a balanced manner. Repeat above steps 4) to 6).
   9) After using, turn the fine adjust knob counterclockwise and remove the micro-checker.
   10) After installing the earth plate, supply power and set for the Stop mode.

6. Perform the interchangeability adjustment (refer to section 2.4.6).

2.3.3 Full erase head

1. Disconnect the connector CN1 from the full erase head.
2. Take out screw (1) and remove the full erase head from the erase head arm.
3. Replace the full erase head and reassemble by reversing the above steps.

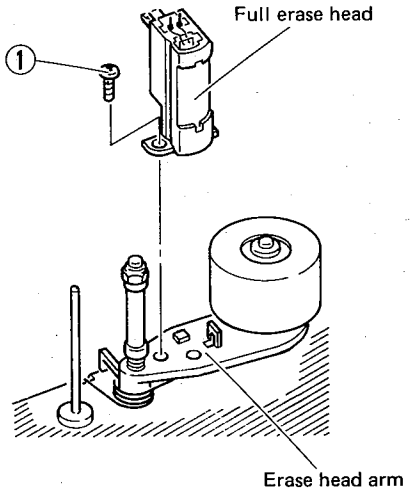


Fig. 2-3-5 Replacement of F.E. head

2.3.4 Audio/control head

1. Disconnect connectors CN1 and CN2 from the A/CTL HEAD board.
2. Take out screws (1) and remove the audio/control head with the head base.

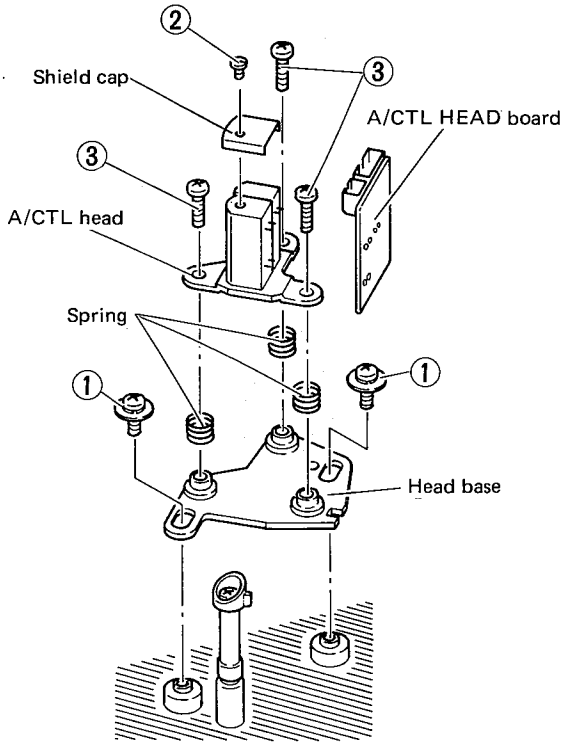


Fig. 2-3-6 Replacement of A/CTL head

3. Unsolder the six terminals coming from the heads and remove the A/CTL HEAD board.
4. Take out screw (2) and remove the shield cap from the audio/control head.
5. Take out screws (3) to separate the audio/control head from the head base. Use care regarding springs.
6. Replace the audio/control head and reassemble by reversing the above steps.
   Before mounting on the main-deck, perform rough-adjustment of audio/control head height as shown in Fig. 2-3-7.

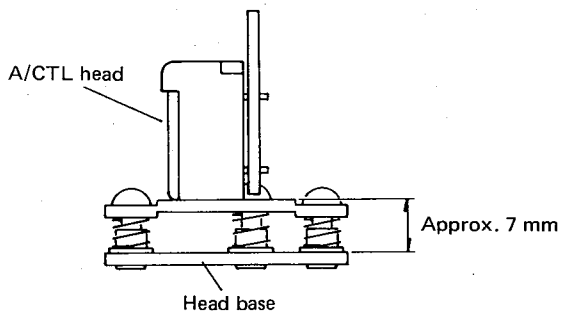


Fig. 2-3-7 A/CTL head height

7. Perform the tape transport/interchangeability checks and adjustments (refer to sections 2.4.5 and 2.4.6).

2.3.5 Pinch roller

1. Take out slit washer (1) and slit washer (2), and remove the pinch roller arm in the upward direction.
2. After cleaning the pinch shaft, spread grease on it.
3. Replace the pinch roller arm and reassemble by reversing the above steps. Avoid staining the pinch roller with grease.

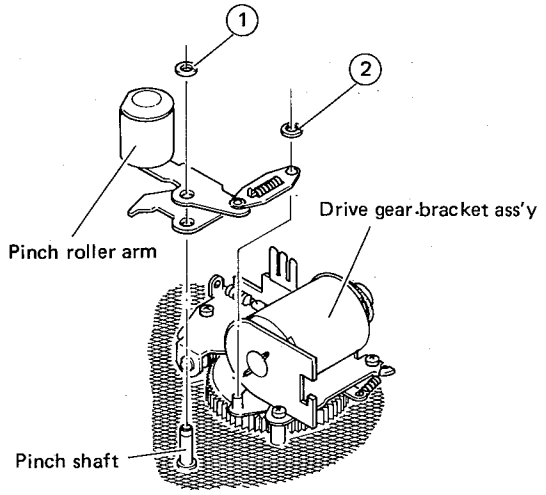


Fig. 2-3-8 Replacement of pinch roller

2.3.6 Capstan motor

1. Take out slit washer (1) and remove the guide arm with spring.
2. Disconnect connector CN3 from the DECK TERMINAL board.

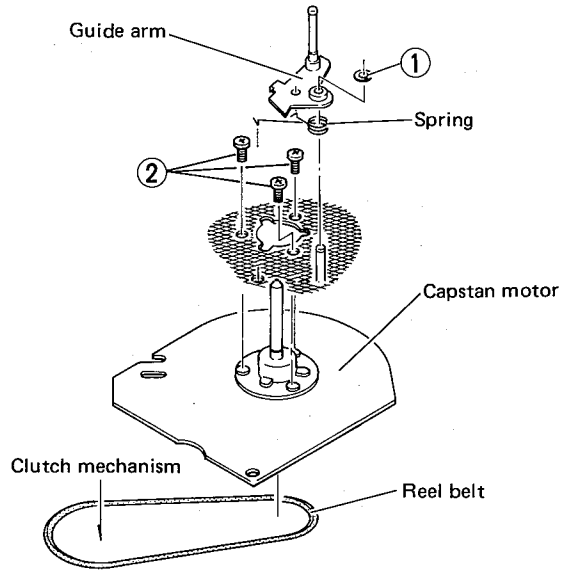


Fig. 2-3-9 Replacement of capstan motor

3. Disengage the reel belt from the capstan motor and the pulley of the clutch mechanism assembly.
4. Take out three screws (2) and remove the capstan motor in the downward direction. Use care regarding the motor brake.
5. Replace the capstan motor and reassemble by reversing the above steps.

2.3.7 Mode control motor

1. Take out screws (1), (2) and (3) to free the main deck from the chassis.
2. Disengage the mode control belt from the motor pulley.
3. Disconnect connector CN1 from the MOTOR board. Take out screws (4) and (5), then remove the mode control motor.
4. Unsolder the mode control motor from the MOTOR board and replace.
5. Observe motor polarity (+ side upward) and reassemble by reversing the above steps.

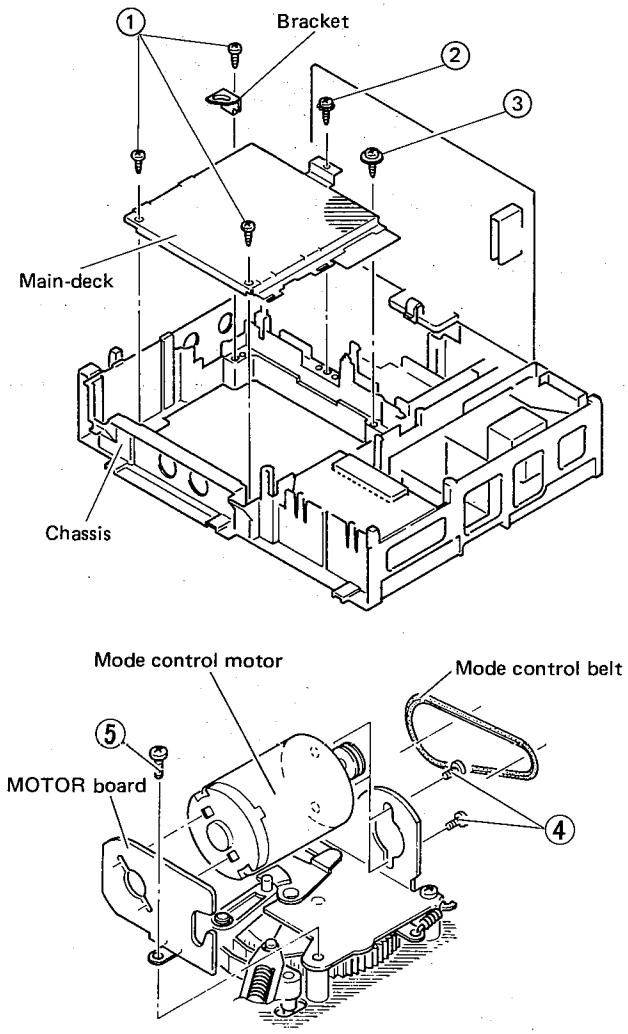


Fig. 2-3-10 Removal of mode control motor

2.3.8 Cassette motor

1. Remove the cassette housing (refer to section 2.3.1).
2. Unsolder the two wires from the cassette motor.

DISTINCTION	WIRE COLOR
Thick boss	White
Thin boss	Gray

Table 2-3-2 Cassette motor wiring

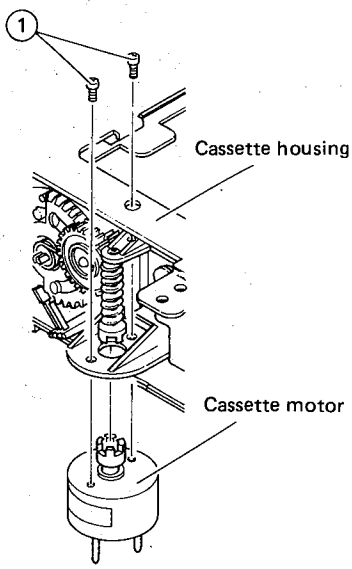


Fig. 2-3-11 Replacement of cassette motor

3. Take out two screws (1) and remove the cassette motor.
4. Replace the cassette motor and reassemble by reversing the above steps. Use care regarding the motor wire polarity (refer to Table 2-3-2).
5. Reinstall the cassette housing into its original position.

2.3.9 Reel disks

- Supply reel disk

1. Take out slit washer (1) and remove the supply loading brake with spring.
2. Disengage the tension band holder from the tension arm and move the tension band to the side.
3. Take out slit washer (2) and remove the supply reel disk upwards. Use care regarding the washers.
4. After cleaning the reel shaft with alcohol, lubricate it with one drop of sewing machine oil. Do not over lubricate.
5. Replace the supply reel disk and reassemble by reversing the above steps.
6. Perform the back tension check (refer to section 2.4.4).

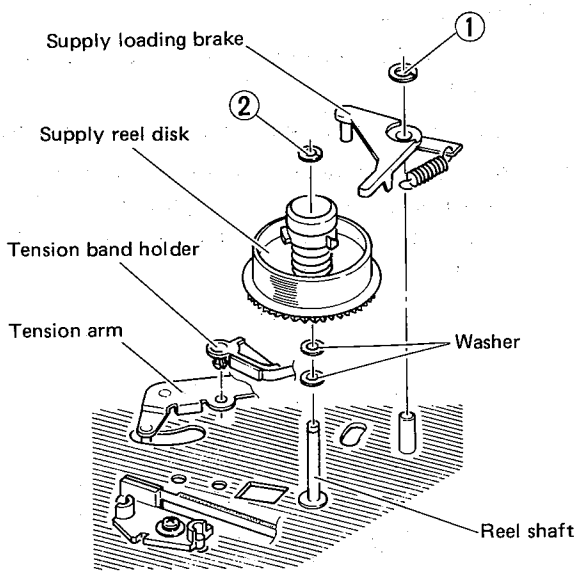


Fig. 2-3-12 Replacement of supply reel disk

- Take-up reel disk

1. Take out slit washer (1) and remove the take-up reel disk upwards while moving the take-up loading brake. Use care regarding the washers.
2. After cleaning the reel shaft with alcohol, lubricate it with one drop of sewing machine oil. Do not over lubricate.
3. Replace the take-up reel disk and reassemble by reversing the above steps.

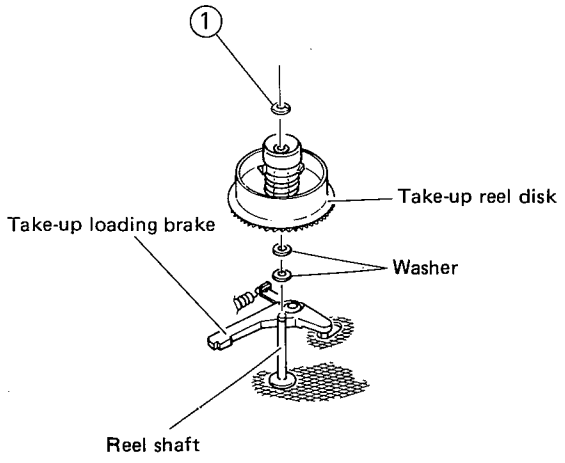


Fig. 2-3-13 Replacement of take-up reel disk

2.3.10 Clutch mechanism

- Take-up and Supply clutches

1. Remove the take-up reel disk (refer to section 2.3.9).
2. Take out slit washer (1), then remove the take-up clutch with shifting the take-up main brake. Use care regarding the washer under the clutch.
3. Clean the clutch shaft with alcohol, then lubricaate it with one drop of sewing machine oil. Do not over lubricate.
4. Replace the take-up clutch and reassemble by reversing the above steps.
5. In the same manner, remove the supply reel disk and replace the supply clutch.
6. Perform the take-up torque check (refer to section 2.4.3).

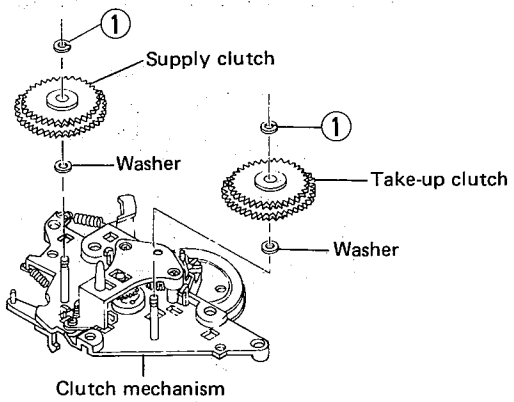


Fig. 2-3-14 Replacement of clutches

- Clutch mechanism

1. Disengage the five springs from the clutch mechanism. These springs come from the supply loading brake, take-up loading brake, main brake slider, supply main brake and take-up main brake.
2. Disengage the reel belt from the pulley of the clutch mechanism.
3. Take out screw (1) and remove the clutch mechanism.

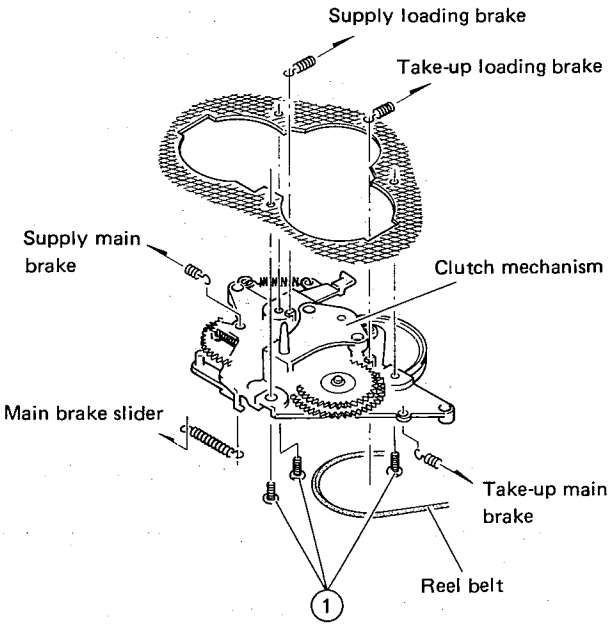


Fig. 2-3-15 Replacement of clutch mechanism

4. Replace the clutch mechanism and reassemble by reversing the above steps.
5. Perform the take-up torque check (refer to section 2.4.3).

2.3.11 Brush

1. Take out screw (1) and remove the brush, and clean the commutator with alcohol.
2. Replace and install the brush as before, check that the brush contacts the center of the commutator.

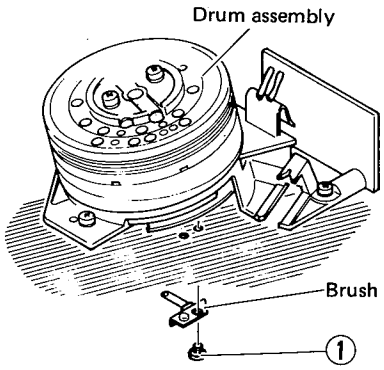


Fig. 2-3-16 Replacement of brush

2.3.12 Tension band

1. Take out slit washer (1) and remove the supply loading brake with spring.
2. Take out screw (2) and disengage the tension band from the tension arm, then replace the tension band.

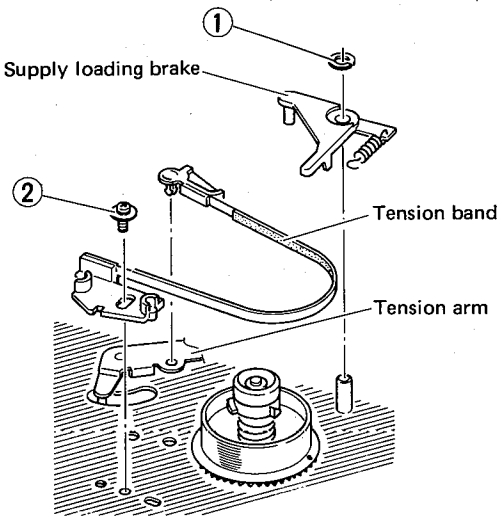


Fig. 2-3-17 Replacement of tension band

3. Reassemble the tension band by reversing the above steps.
4. Perform the tension pole position check and the back tension check (refer to sections 2.4.2 and 2.4.4).

2.3.13 Pick-up head

1. Unsolder the two wires from the terminals of the pick-up head.
2. Take out screw (1) and remove the pick-up head.
3. Replace and reassemble the pick-up head by reversing the above steps. Use care regarding the wire polarity. Check that the pick-up head is toward the center position of the drum shaft.

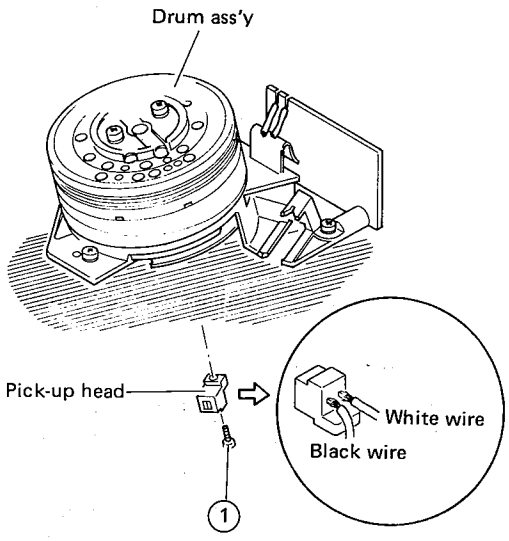


Fig. 2-3-18 Replacement of pick-up head

2.4 CHECKS AND ADJUSTMENTS

2.4.1 Mechanism timing check

- Loading rings and loading gear (2)

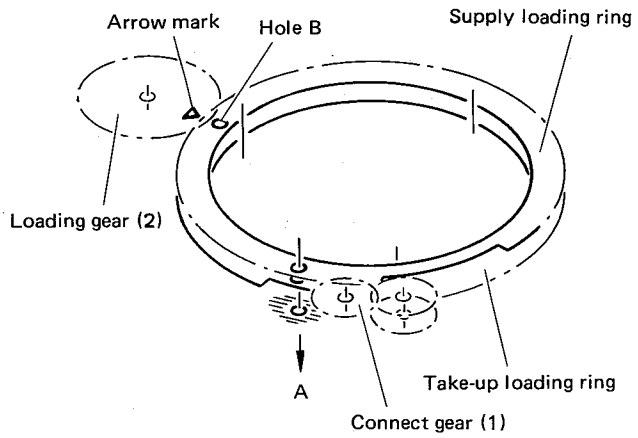


Fig. 2-4-1 Loading ring/loading gear (2)

1. Confirm that the two holes of supply and take-up loading rings are overlapped through the hole of the main-deck (arrow A in Figure). If a discrepancy is noted, after removing the connect gear (1), adjust the loading rings to obtain the correct position. Holes are overlapped in the Stop (FF/REW) mode position.
2. At the same time, confirm that the arrow mark of the loading gear (2) corresponds with hole B of the supply loading ring. If a discrepancy is noted, remove and re-install the loading gear (2) to obtain the correct position.

- Cam gear (drive gear bracket) and loading gear (1)

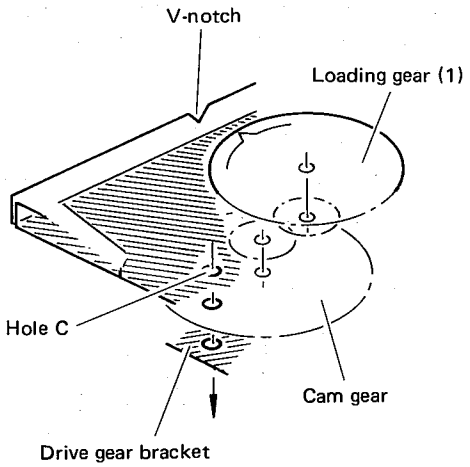


Fig. 2-4-2 Cam gear/loading gear (1)

1. When the two holes of cam gear and drive gear bracket are overlapped through the hole C of the main-deck (FF/REW mode position), confirm that the arrow indication of loading gear (1) is aligned with the V-notch of the main-deck. If a discrepancy is noted, remove and re-install the loading gear (1) to obtain the correct position.

2.4.2 Tension pole position check

1. Without loading a tape, set for the Play mode (refer to section 2.3.1).
2. Confirm that the center of the tension pole lies upon the left side of the supply guide pin bushing as shown in Fig. 2-4-3.
3. If necessary, loosen screw (1) and adjust the tension band holder to obtain the correct tension pole position.

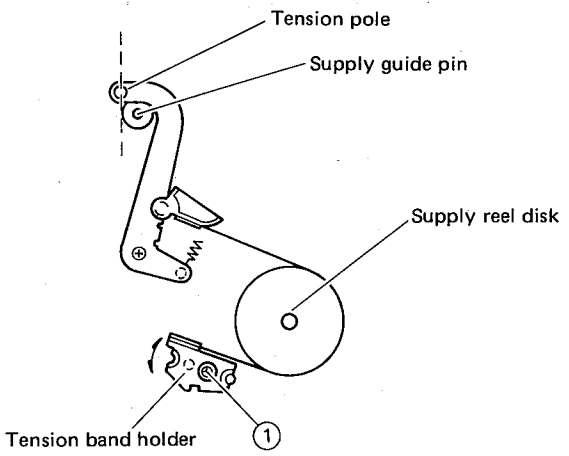


Fig. 2-4-3 Tension pole position

2.4.3 Take-up torque check

1. Set the Play (2H: SP) mode without loading a tape (refer to section 2.3.1).
2. Set the torque gauge on the take-up reel disk.
3. The torque gauge consists of upper and lower sections connected by a spring mechanism. When grasped by hand, then the grip on the gauge gradually relaxed, at a certain point, the upper indicator section will turn by the spring force to follow the rotating lower section. Read the valve at this point. The correct value is between 60 and 100 gf-cm.
4. If not the correct value, replace the take-up and supply clutches.

2.4.4 Back tension check

1. Use the back tension cassette gauge and set for the Play (2H: SP) mode.
2. Confirm that the indication is between 11 and 19.
3. If not the correct value, check the tension pole position (refer to section 2.4.2) and the condition of the spring between tension arm and main-deck and replace the tension band (refer to section 2.3.12).
4. If necessary, also replace the supply reel disk (refer to section 2.3.9).

2.4.5 Tape transport system checks and adjustments

The tape transport system has been precisely aligned at the factory and normally does not require readjustment. The following check is therefore necessary only in cases of severe usage or when replacing parts affecting the tape transport system.

- Tape transport checks

1. Use a 120-minute tape and check at the tape beginning and ending portion according to the following steps.

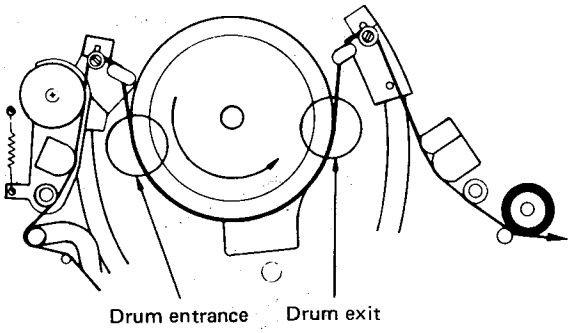


Fig. 2-4-4 Drum entrance/exit

1) During Play mode, observe tape at the entrance and exit portions of the drum lead.
Confirm that the tape slips neither upward nor downward with respect to the lead.

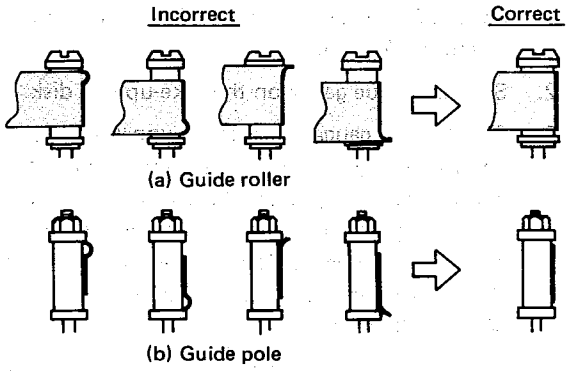


Fig. 2-4-5 Guide roller/guide pole

2) If defects are noted during the above check, perform the guide roller height adjustment.
3) During Play mode, observe the tape at the take-up and supply guide poles and guide rollers.
Confirm absence of curling, wrinkling, etc.
4) If defects are noted during the above check, perform the supply guide pole height and A/CTL head inclination adjustments.

2. At the ending portion of the recorded 120-minute tape, see for the Search Rev. (7 times speed) mode.
1) Confirm absence of curling, wrinkling, slip, etc. at the take-up and guide pole.
2) If defects are noted during the above checks, investigate the pinch roller.
3. Perform the interchangeability checks and adjustment (refer to section 2.4.6).

- Guide roller height adjustment

1. Slightly loosen setscrew under the guide roller of the pole base.
2. Use a cassette tape and set for the Play mode.
3. With a screwdriver, slightly turn the guide roller so that the tape travels smoothly in the drum lead without slipping upwards or downwards.

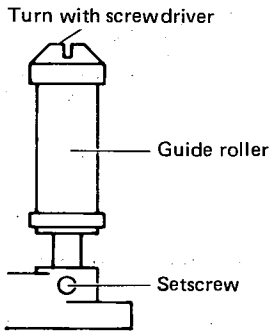


Fig. 2-4-6 Guide roller height adjustment

Notes:
1) Loosen the setscrew only enough to allow the guide roller to be turned.
If excessively loose, tape motion may turn the roller inadvertently.
2) Turn the roller carefully to avoid damage to the tape.

- Supply guide pole height adjustment

1. Use a cassette tape and set for the Play mode.
2. Use a metric nutdriver to turn the nut to align the tape lower edge with the upper face of the supply guide pole lower flange.

- Audio/control head inclination

1. Use a cassette tape and set for the Play mode.
2. Turn audio/control head screw (1) and align the tape lower edge with the upper face of the take-up guide pole lower flange.

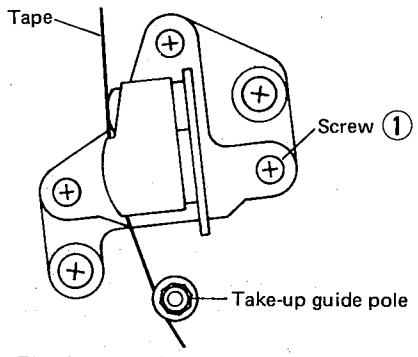


Fig. 2-4-7 Inclination of A/CTL head

Note: Take-up guide pole height is unable to adjust.

2.4.6 Interchangeability checks and adjustments

Before using an alignment tape, use a regular tape and confirm correct tape transport operation.

- Preliminary checks and adjustments

1. Connect an oscilloscope to TP106 (PB FM) of the MAIN board. Trigger the oscilloscope externally with the signal from TP411 (DRUM F.F.) of the MAIN board.
2. Play the alignment tape (stairstep signal) MH-1.

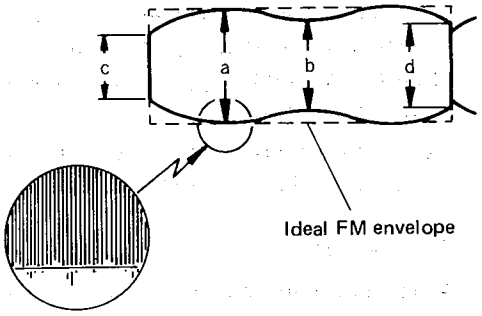


Fig. 2-4-8 FM waveform (max. output)

1) Turn the TRACKING knob to obtain the maximum FM output.
Observe the FM waveform, read the maximum level (a) and the minimum levels (b), (c) and (d). Confirm that:

$\frac{b}{a} \geqq 0.7, \frac{c}{a} \geqq 0.5$ and $\frac{d}{a} \geqq 0.5$

Note: If the waveform is serrated, read the value at the most uniform serrations.

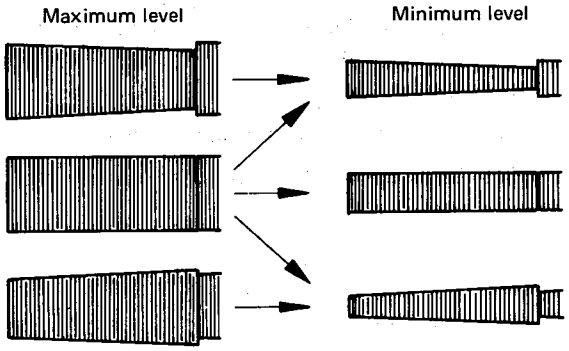


Fig. 2-4-9 Normal waveform examples

2) Turn the TRACKING knob to vary the FM output from maximum to minimum.
Confirm that the waveform variation is nearly parallel.
3) If the above checks yield normal results, proceed to the audio/control head adjustments.
If defects are noted, perform the following adjustments.

3. Loosen the setscrews of the supply and take-up guide rollers. If the guide rollers turn freely, slightly tighten the setscrews.
4. Play the alignment tape (stairstep signal) MH-1.
5. Observe oscilloscope display and adjust the TRACKING knob for maximum FM output.

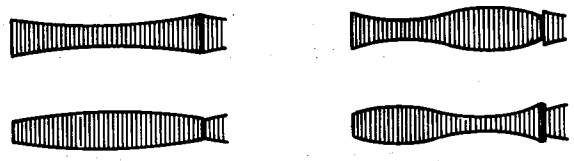


Fig. 2-4-10 Incorrect waveform examples

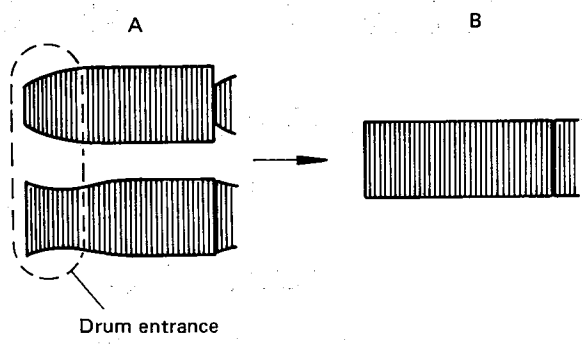


Fig. 2-4-11 Drum entrance adjustment

1) Refer to Figure. Examples of incorrect waveforms are shown by A.
Use a slotted screwdriver to adjust the supply guide roller so that the rising portion (drum entrance) of the waveform becomes flat as shown by B.
2) In the same manner as for the drum entrance, turn the take-up guide roller to adjust the falling portion (drum exit) of the FM waveform.
Incorrect examples are shown by C in Figure, while D indicates the correct adjustment.

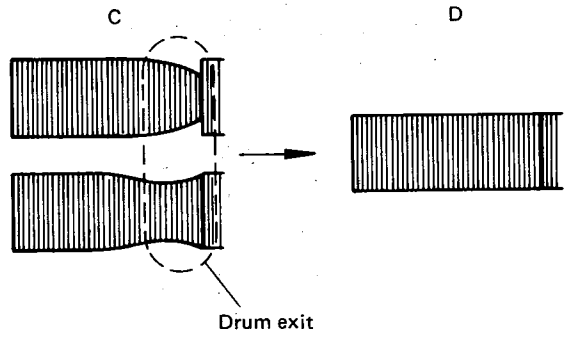


Fig. 2-4-12 Drum exit adjustment

3) In addition to observing the waveform, confirm absence of tape slippage or curling at the supply and take-up guide poles.
If the tape separates from the guide or wrinkling occurs at the supply guide pole, adjust the supply guide pole height (refer to section 2.4.5).
If at the take-up guide pole, adjust by turning the audio/control head screw (refer to section 2.4.5).

6. Observe the FM waveform and adjust the TRACKING knob for minimum FM output level.
   1) If the waveform becomes similar to A, B, C or D in Figure, carefully adjust the supply and take-up guide rollers so that the waveform becomes similar to E, F or G.

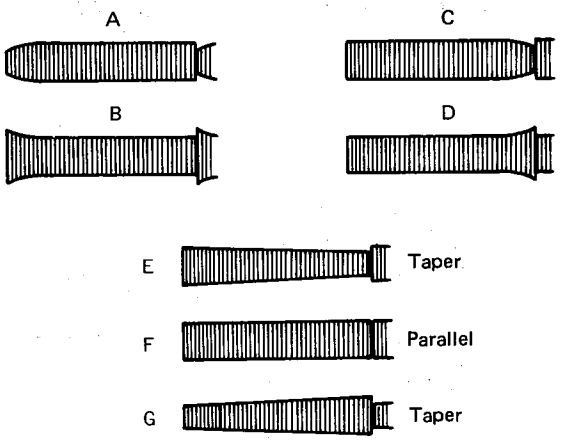


Fig. 2-4-13 Minimum FM waveform

Note: At this time, if the waveform fluctuates, adjust for minimum fluctuation.

   2) Vary the FM output level and perform fine adjustment of the supply and take-up guide rollers.

- Audio/control head height and azimuth adjustments

Incorrect audio/control head height can impair audio signal-to-noise ratio when playing back a pre-recorded tape.

1. Connect oscilloscope to the AUDIO OUT terminal of the MAIN board.
2. Play 7 kHz segment (stairstep signal) of the alignment tape MH-1.

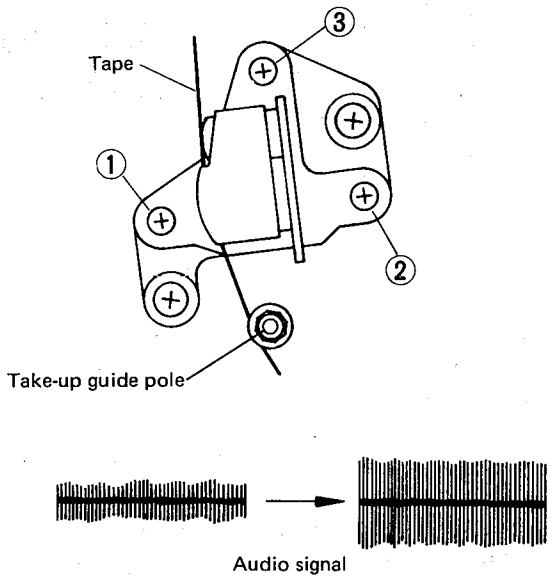


Fig. 2-4-14 Audio/Control head adjustment

   1) Turn screw (2) and screw (3) to obtain maximum audio output. Adjust screw (2) so that small tape wrinkles are not produced at the take-up guide pole, and azimuth with screw (3).
   2) Turn screws (1), (2) and (3) by small and equal increments to adjust the audio/control head height for maximum audio output.
   With screw (1) as reference, adjust inclination with screw (2) and azimuth with screw (3).

   Notes:
   a) During adjustment, avoid turning reference screw (1) by more than approximately 1/4 turn (this is also to avoid damaging the alignment tape).
   b) After adjusting screw (2), be sure to adjust the azimuth with screw (3).

3. Repeat these adjustment steps to obtain maximum audio output with minimum level fluctuation.

- Setscrew tightening

1. After confirming absence of tape wrinkling and other transport irregularities, tighten the setscrews under the guide rollers while in the Stop mode.

   Note: Since the guide rollers are easily moved, use care when tightening.

2. Again perform the preliminary checks.

- Servo circuit adjustment

1. Perform tracking preset adjustment (refer to section 3.3.4).

- Control head phase adjustment

1. Connect an oscilloscope to TP106 (PB FM) of the MAIN board. Trigger the oscilloscope externally with the signal from TP411 (DRUM F.F.) of the MAIN board.
2. Play the alignment tape (stairstep signal) MH-1.
3. Set the trigger to (−) slope and observe the CH-1 FM waveform.

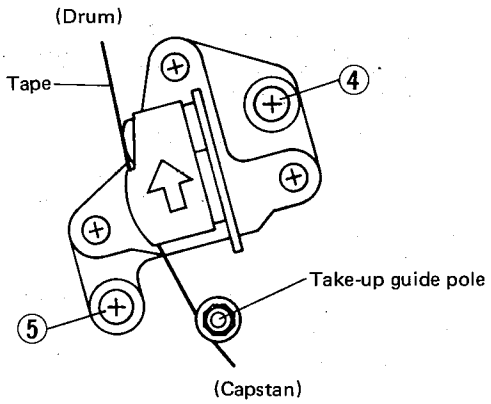


Fig. 2-4-15 Control head phase adjustment

1) Set the TRACKING knob to AUTO (center click position).
2) Loosen screws (4) and (5). Shift the A/CTL head assembly fully in the direction of the capstan.
3) Cover screw (4) with the A/CTL head position tool and set the pin of the tool into the hole next to screw (4).
4) Gradually turn the tool clockwise and observe the FM waveform output. Set the A/CTL head assembly at the point of the first output peak.

- Final checks

1. Connect an oscilloscope to TP106 (PB FM) of the MAIN board. Trigger the oscilloscope externally with the signal from TP411 (DRUM F.F.) of the MAIN board.

1) Play the alignment tape MH-1L (stairstep signal). Confirm that the FM waveform satisfies the specifications during playback of alignment tape MH-1. Refer to Fig. 2-4-8.
2) Supply a video signal and perform recording, then play back. Confirm that the FM waveform also satisfies the specifications during playback of MH-1. (Both SP/EP modes)

2. Perform overall checks and adjustments of the servo circuit (refer to section 3.3) and video circuit (refer to section 3.4).

3. Perform the audio circuit adjustment (refer to section 3.5).

SECTION 3
ELECTRICAL ADJUSTMENTS

3.1 PREPARATION

Electrical adjustments are required after replacing circuit components and certain mechanical parts.
It is important to perform these adjustments only after all repairs and replacements have been completed. Also, do not attempt these adjustments unless the proper equipment is available.

3.1.1 Required test equipment

1. Color television or monitor
2. Oscilloscope: wide-band, dual-trace, triggered delayed sweep
3. Frequency counter
4. Audio oscillator
5. Audio voltmeter
6. Digital voltmeter
7. Signal generator: RF/IF sweep/marker
8. Signal generator: NTSC color bar, stairstep
9. Recording tape
10. Alignment tapes: (MH-1, MH-1L, MH-1M)

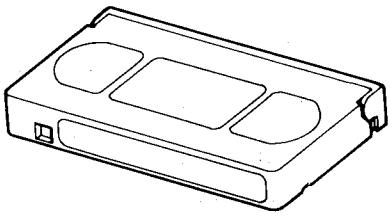


Fig. 3-1-1 Tape

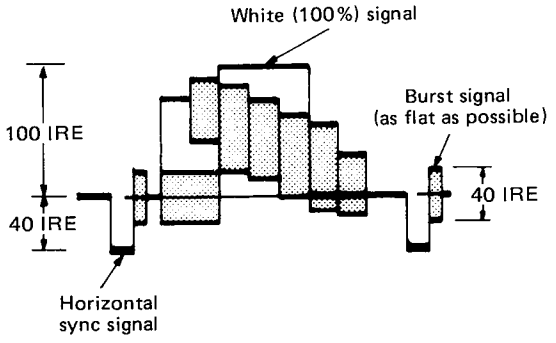


Fig. 3-1-2 Color bar signal of pattern generator

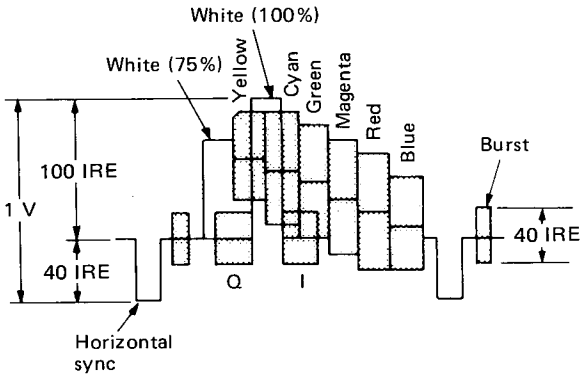


Fig. 3-1-3 Color bar signal waveform

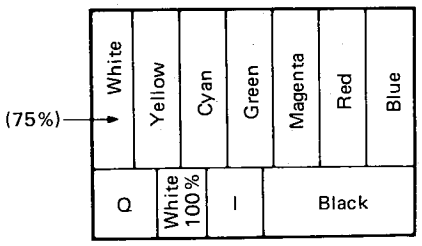


Fig. 3-1-4 Color bar pattern

3.1.2 Alignment tape contents

1. MH-1 (Standard Play: 2H mode) contents

Segment	Playback Time	Video Signal	Audio Signal	Applications
1	10 minutes	Stairsteps	7 kHz	• Interchangeability checks and adjustments • Servo circuit checks and adjustments • Audio head azimuth adjustments
2	5 minutes	(none)	3 kHz	• Tape speed checks • Wow and flutter checks
3	10 minutes	Color bars	1 kHz	• Video signal playback circuit checks and adjustments • Audio signal playback circuit checks and adjustments
4	3 minutes	RF sweep	(none)	• Video head resonance adjustments • Markers: 2.0, 4.0, 5.0 MHz

Table 3-1-1

2. MH-1L (Extended Play: 6H mode) contents

Segment	Playback Time	Video Signal	Audio Signal	Applications
1	5 minutes	Stairsteps (CH-1 only)	(none)	• Servo circuit checks and adjustments
2	5 minutes	Color bars	(none)	• Video signal playback circuit checks and adjustments
3	3 minutes	RF sweep	(none)	• Video head resonance adjustments • Markers: 2.0, 4.0, 5.0 MHz

Table 3-1-2

3. MH-1M (Long Play: 4H mode) contents

Segment	Playback Time	Video Signal	Audio Signal	Applications
1	5 minutes	Stairsteps	(none)	• Servo circuit checks and adjustments
2	10 minutes	Color bars	1 kHz	• Video signal playback circuit checks

Table 3-1-3

3.1.3 Check and adjustment steps

The check and adjustment steps are provided in the following in the form of charts. For clarity, the nomenclature used in the charts is outlined below.

No. Checks and adjustments are numbered in the recommended sequence in which they are to be performed.

Item Name assigned to the particular check and adjustment step.

Check Point Location to which measuring instrument (oscilloscope unless otherwise noted) is to be connected.

Adjustment Parts Variable component (resistor, capacitor, etc.) to be adjusted in this step. Dash (—) indicates check only.

Signal & Mode

- Input signal required to perform adjustment. Dash (—) indicates that special signal is not required.
- Equipment operating mode at time of check or adjustment.

Color bar	Color bar signal as video input
Stairstep	Stairstep signal as video input
1 kHz	Supply a 1 kHz sinewave as audio input signal.
MH-1 Color bar	Play color bar segment of MH-1 alignment tape.
MH-1 Stairstep	Play stairstep segment of MH-1 alignment tape.
MH-1 1 kHz	Play 1 kHz audio signal segment of MH-1 alignment tape.
MH-1 RF sweep	Play RF sweep segment of MH-1 alignment tape.
MH-1L Color bar	Play color bar segment of MH-1L alignment tape.
MH-1L Stairstep	Play stairstep segment of MH-1L alignment tape.
MH-1L RF sweep	Play RF sweep segment of MH-1L alignment tape.
MH-1M Color bar	Play color bar segment of MH-1M alignment tape.
MH-1M Stairstep	Play stairstep segment of MH-1M alignment tape.
STOP	Power on and machine in Stop mode.
REC	Recording mode
PB	Playback mode
REC ↓ (another mode)	Use blank tape, record, then play back in the mode specified.
SEARCH	Shuttle Search (SFWD and SREV) playback mode
SLOW	Slow motion playback mode
STILL	Playback then Pause
A DUB	Audio dubbing mode

Description and Waveform This column provides an explanation of the step, notes, adjustment values and waveform diagrams.

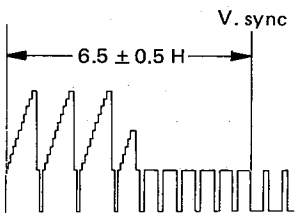
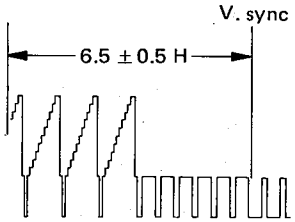
3.2 REGULATOR CIRCUIT (0 1 POWER SUPPLY board)

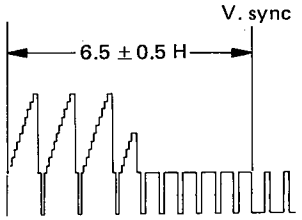
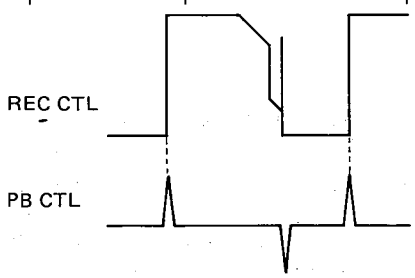
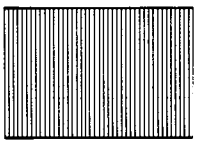
Note: Unless otherwise specified, test points and variable resistors are located on the REG board.

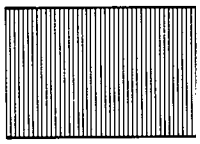
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	5.0 V DC Output Voltage	TP1	R6	REC	1. Connect the digital voltmeter to TP1. 2. Adjust R6 for 5.33 ± 0.1 V.

3.3 SERVO CIRCUIT (0 2 MAIN board)

Note: Unless otherwise specified, test points and variable resistors are located on the SERVO board.

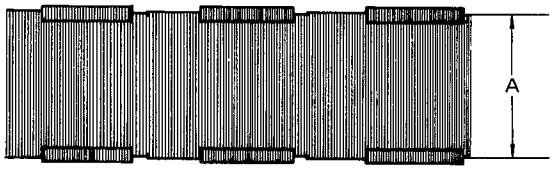
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	DRUM DISCR. Position	TP421	R437	REC	1. Connect a jumper wire between TP421 and IC402 pin 26 (SWD 5 V). 2. Connect a frequency counter to TP414. Adjust R437 to obtain 1800 Hz ± 6 Hz.
2	SP PB Switching Point	VIDEO OUT or TP110	R429 (CH-1)	• PB • MH-1 Stairsteps • Trigger slope (–) • SP mode	1. Connect an oscilloscope to VIDEO OUT or TP110 of the VIDEO board. 2. Play back the stairsteps segment of MH-1 alignment tape. 3. Trigger the oscilloscope externally (– slope) with the signal from TP411 (DRUM FF). 4. Adjust R429 to position the trigger point 6.5 ± 0.5 H from V. sync.  **Fig. 3-3-1**
			R427 (CH-2)	• Trigger slope (+)	5. Trigger the oscilloscope externally (+ slope) with the signal from TP411 (DRUM FF). 6. Adjust R427 to position the trigger point 6.5 ± 0.5 H from V. sync.  **Fig. 3-3-2**

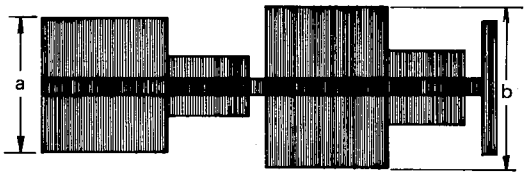
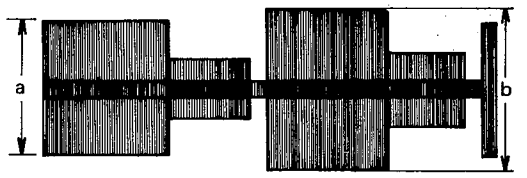
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
3	EP PB Switching Position	VIDEO OUT or TP110	R431	• PB • MH-1L stairsteps • Trigger slope (–) • EP mode	1. Connect an oscilloscope to VIDEO OUT or TP110 of the VIDEO board. 2. Trigger the oscilloscope externally (– slope) with the signal from TP411 (DRUM FF). 3. Play back the stairsteps segment of MH-1L alignment tape. 4. Adjust R431 to position the trigger point 6.5 ± 0.5 H from V. sync.  **Fig. 3-3-3**
4	SP Tracking Preset	TP401	R443	• REC then PB • Color bar • Trigger slope (–) • SP mode	**Notes:** 1. Set R2 (TRACKING) of the FRONT SW board to the center click position. 2. Adjust R13 (TRACKING PRESET) of the FRONT SW board so that the total resistance of R13 and R2 becomes 150 kΩ ± 2%. 1. Connect an oscilloscope to TP401. 2. Set the tracking control (R2) of the Front SW board to the center click position. 3. Trigger the oscilloscope externally (– slope) with the signal from TP411 (DRUM FF). 4. Set for the REC mode and make a note of the TP403 (REC CTL) waveform rising point. 5. Play back the recorded segment. Adjust R443 to align the rising point of the TP401 (PB CTL) waveform with the REC CTL waveform rising point noted in step 4.  **Fig. 3-3-4**
5	EP Tracking Preset	TP106	R448	• PB • MH-1L stairsteps • EP mode	1. Connect an oscilloscope to TP106 of the VIDEO board. 2. Set the tracking control (R2) of the Front SW board to the center click position. 3. Trigger the oscilloscope externally with the signal from TP411 (DRUM FF). 4. Play back the stairsteps segment of MH-1L alignment tape. 5. Adjust R448 for the maximum FM level.  **Fig. 3-3-5**

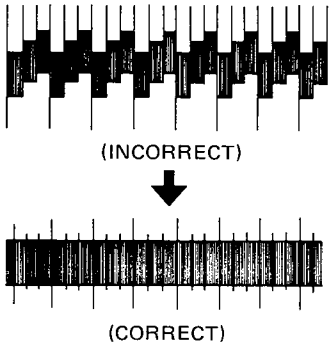
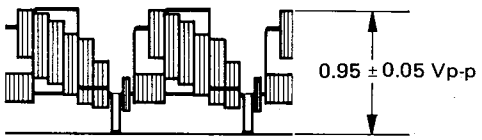
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
6	LP Tracking Preset	TP106	R446	• PB • MH-1M stairsteps • LP mode	1. Connect an oscilloscope to TP106 of the VIDEO board. 2. Set the tracking control (R2) of the Front SW board to the center click position. 3. Trigger the oscilloscope externally with signal from TP411 (DRUM FF). 4. Play back the stairsteps segment of MH-1M alignment tape. 5. Adjust R446 for the maximum FM level.  **Fig. 3-3-6**
7	V. Pulse Position	• MONITOR • VIDEO OUT or TP110	R433	• STILL • PB • MH-1 color bar • SP mode	1. In the Still mode, observe the monitor and adjust R433 for the minimum vertical jitter. 2. Confirm that the V. pulse width becomes 185 ± 50 μs.

3.4 VIDEO CIRCUIT ([0][2] MAIN board)

Note: Unless otherwise specified, test points and variable resistors are located on the VIDEO board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	VXO	TP312	C315	• PB • MH-1 color bar • SP mode	1. Connect a frequency counter to TP312. 2. Play back the color bar segment of MH-1 alignment tape. 3. Adjust C315 for 3.579545 MHz ± 50 Hz.
2	REC FM Level	TP104	R145	• REC • Color bar • EP mode	1. Connect an oscilloscope to TP104. 2. Adjust R145 for 130 mVp-p between centers of the waveform portions indicated in the figure.  A = 130 mVp-p **Fig. 3-4-1**

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
3	EP REC Color Level and Balance	TP304	R316	• PB • MH-1L color bar • EP mode • REC then PB • Color bar • EP mode	1. Connect an oscilloscope to TP304. Play back a color bar segment of the MH-1L and observe color signal level. 2. Adjust the Tracking control (R2) of the Front SW board for maximum level of the color waveform and make a note of the higher color level. 3. Set the Tracking control (R2) of the Front SW board to the center click position. 4. Record the color bar signal, then play back. Before recording, adjust R316 so that the higher level channel becomes the same (95 to 105%) as the noted level during playback. At this time, confirm that the channel difference is within 3 dB.  **Fig. 3-4-2**
4	SP REC Color Level and Balance	TP304	R315	• PB • MH-1 color bar • SP mode • REC then PB • Color bar • SP mode	**Note:** Perform the SP mode adjustment after completing the EP mode. 1. Connect an oscilloscope to TP304. Play back a color bar segment of the MH-1 and observe color signal level. 2. Adjust the Tracking control (R2) of the Front SW board for maximum level of the color waveform and make a note of the higher color level. 3. Set the Tracking control (R2) of the Front SW board to the center click position. 4. Record the color bar signal, then play back. Before recording, adjust R315 so that the higher level channel becomes 80 to 90% of the noted level during playback. At this time, confirm that the channel difference is within 3 dB.  **Fig. 3-4-3**

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
5	Noise Cancel Balance	TP123	R150	• REC then PB • Color bar • EP mode	1. Connect an oscilloscope to TP123. 2. Record the color bar signal, then play back. 3. Adjust R150 to minimize the waveform.  **Fig. 3-4-4**
6	PB Y Level	VIDEO OUT or TP110	R163	• REC then PB • Color bar • SP mode	1. With a 75Ω load at VIDEO OUT, connect an oscilloscope to TP110. 2. Record the color bar signal, then play back. 3. Adjust R163 for a luminance signal level of 0.95 ± 0.05 Vp-p.  **Fig. 3-4-5**

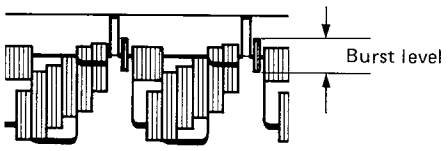
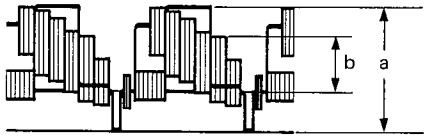
3.5 AUDIO CIRCUIT (0 2 MAIN board)

Note: Unless otherwise specified, test points and variable resistors are located on the AUDIO board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	Audio Bias Level	TP31	R27	REC	1. Connect a digital voltmeter between TP31 and 32. 2. Set for the REC mode without signal. 3. Adjust R27 for 3.6 ± 0.2 mVrms.
2	Audio PB Level	AUDIO OUT	R9	REC then PB	1. Connect an oscilloscope to AUDIO OUT. 2. Supply an audio signal (−8 dBs/1 kHz) to AUDIO IN and record together with a VIDEO signal, then play back. 3. Adjust R9 so that the audio output level during playback becomes −6 ± 1 dBs.

3.6 TUNER/IF CIRCUIT (0 4 TU/IF board)

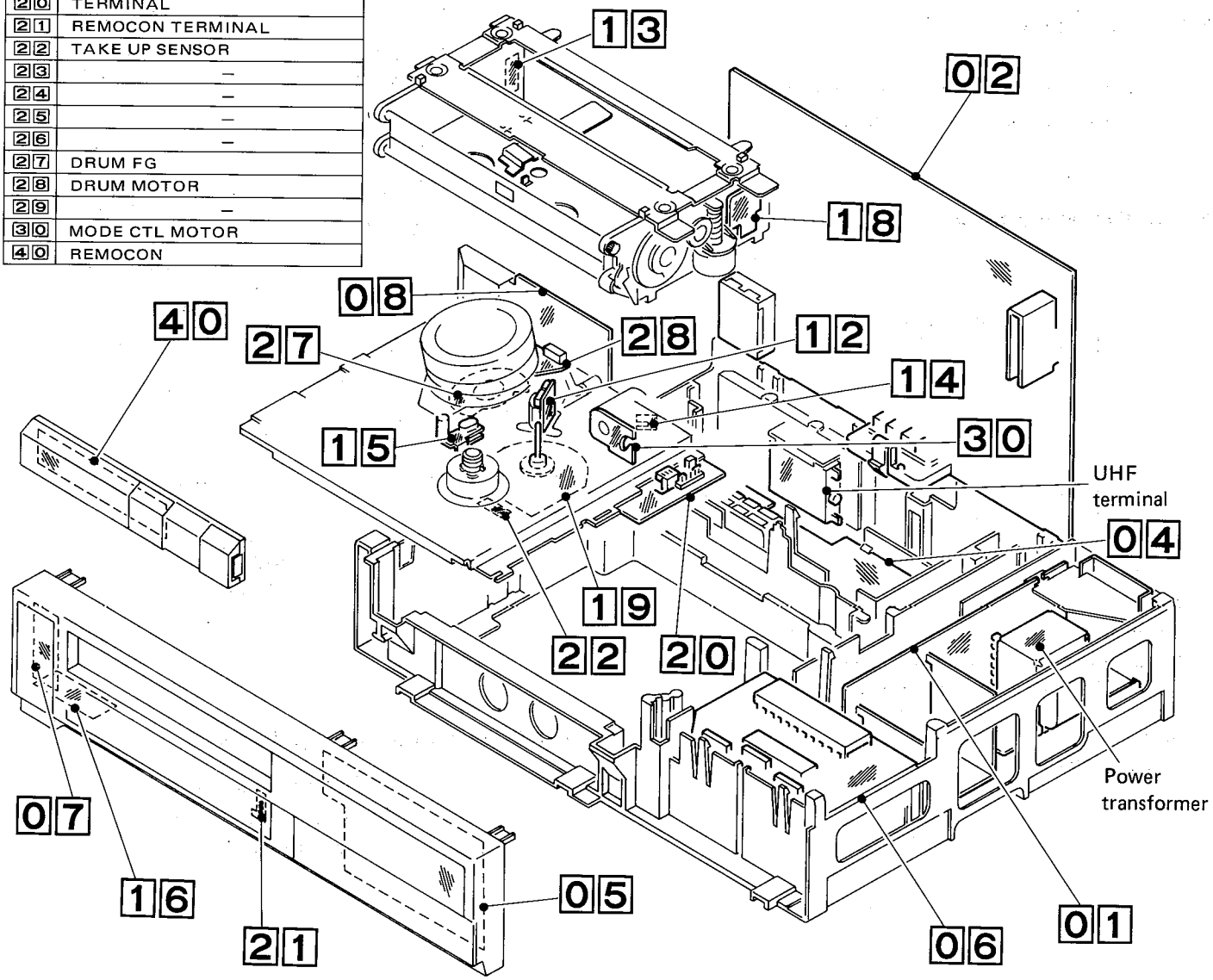
Note: Unless otherwise specified, test points and variable resistors are located on the TU/IF board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	AFC	IC1 Pin 29	T2	TV broadcast	1. Receive a color broadcast on a VHF-HI channels (7 to 10). 2. With AFC SW to OFF, perform fine tuning. Then, precisely read the burst level of IC1 pin 29. Make a note of the burst level. 3. When AFC SW is ON, adjust T2 (AFC) so that the burst level of IC1 pin 29 becomes equal to the noted level as shown in Fig. 3-6-1.  **Fig. 3-6-1**
2	Color Level	CN3 Pin 1	R32	TV broadcast	1. Supply a color bar signal on a VHF-HI channel (7 to 10) from a TV channel signal generator and select the channel corresponding to the generator. 2. With AFC SW ON, adjust R32 to satisfy as shown in Fig. 3-6-2.  a : b = 1 : 0.25 **Fig. 3-6-2** • **Alternate method** 1. Receive a color broadcast on a VHF-HI channels (7 to 10). 2. With AFC SW ON, adjust R32 so that the burst level becomes 1/3 of the sync level.
3	RF AGC	MONITOR	R10	TV broadcast	**Note:** Adjust R10 (RF AGC) to correct for excess noise in the picture or when streaky cross interference occurs due to strong electrical fields. 1. Adjust R10 to minimize noise or streaks on the TV screen. 2. Check for absence of abnormality on all channels.

SECTION 4
CHARTS AND DIAGRAMS

4.1 CIRCUIT BOARD LOCATIONS

No.	NAMES
01	POWER SUPPLY
02	MAIN
03	–
04	TUNER/IF
05	TIMER/DISPLAY
06	PRESETTER
07	FRONT SWITCH
08	DRUM MDA
09	–
10	RF SWITCH/MODULATOR
11	–
12	A/CTL HEAD
13	END SENSOR
14	LOADING SENSOR
15	CASSETTE LED
16	INFRARED
17	–
18	CASSETTE HOUSING
19	CAPSTAN MOTOR
20	TERMINAL
21	REMOCON TERMINAL
22	TAKE UP SENSOR
23	–
24	–
25	–
26	–
27	DRUM FG
28	DRUM MOTOR
29	–
30	MODE CTL MOTOR
40	REMOCON

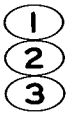


4.1.1 Connections

: Connector

: Board

: Board in connector

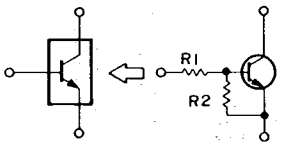


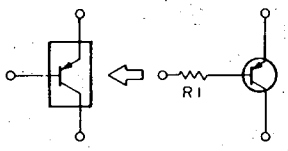
: Connected pattern in the board.

4.1.2 Indications

COUNT UP : Active only at high.
COUNT DOWN : Active only at low.

4.1.3 Digital transistor



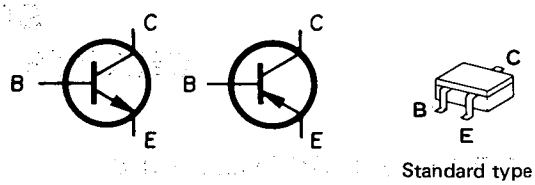


DTA114T T mark only

Note:
The digital transistor includes built in resistors.
It features small size and high rellability.
Both PNP and NPN types are available.

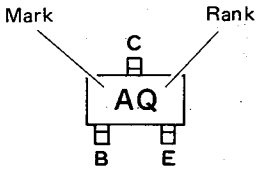
Uses:
Inverter, Interface, driver circuits.

4.1.4 Chip transistor



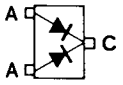
Standard type

TYPE	MARK
2SC2412K	BS
2SA1037K	FS

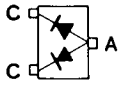


4.1.5 Chip diode

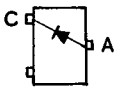
MA151WK

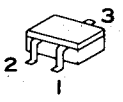


MA151WA



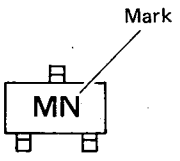
MA151A





Standard type

TYPE	MARK
MA151WA	MT
MA151WK	MN
MA151A	MA



4.1.6 Signal flow in the schematic

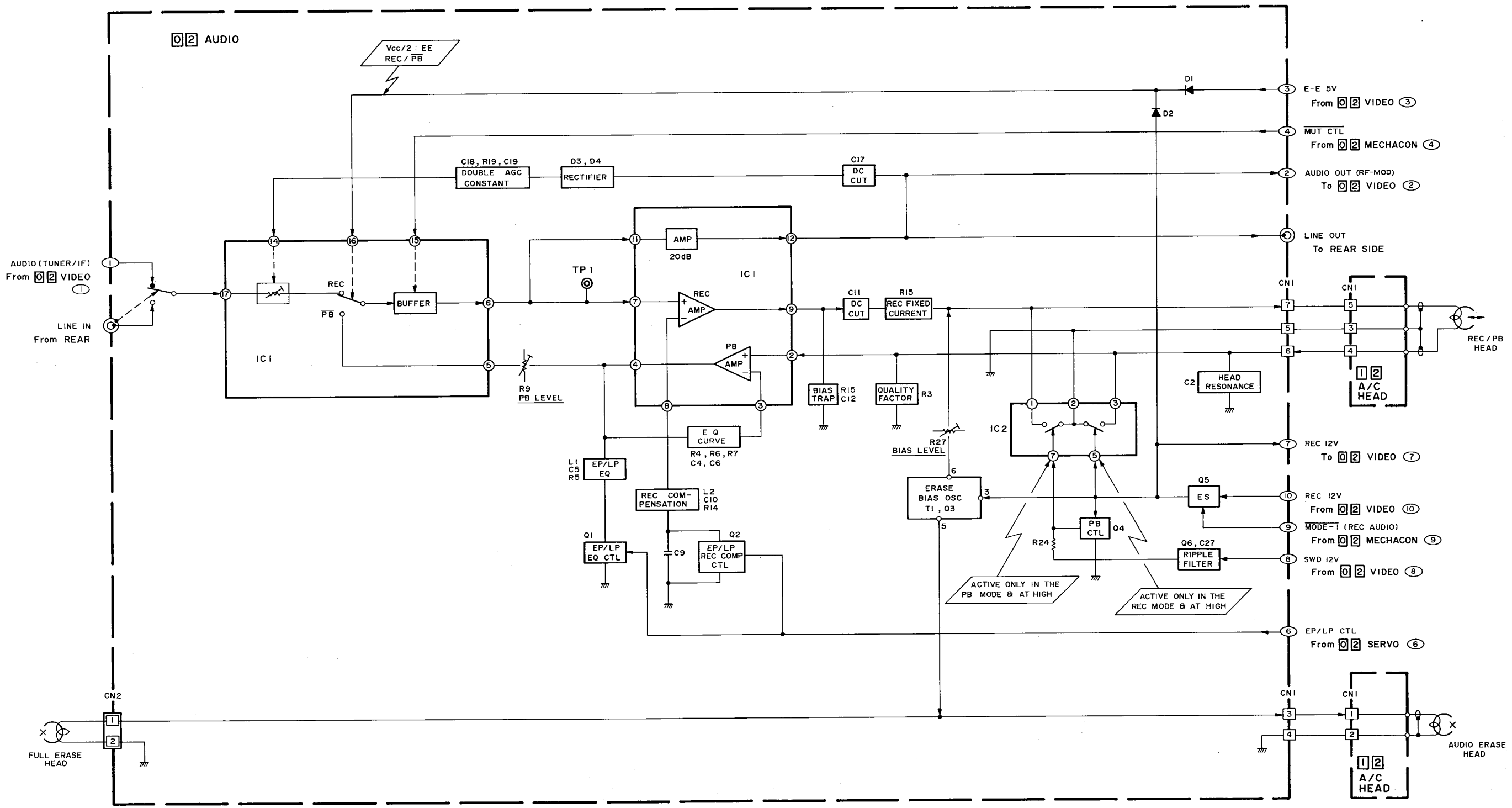
——————→ : Recording signal path
— — — — → : Playback signal path
——·——→ : REC/PB signal path

4.2 KEY TO ABBREVIATIONS

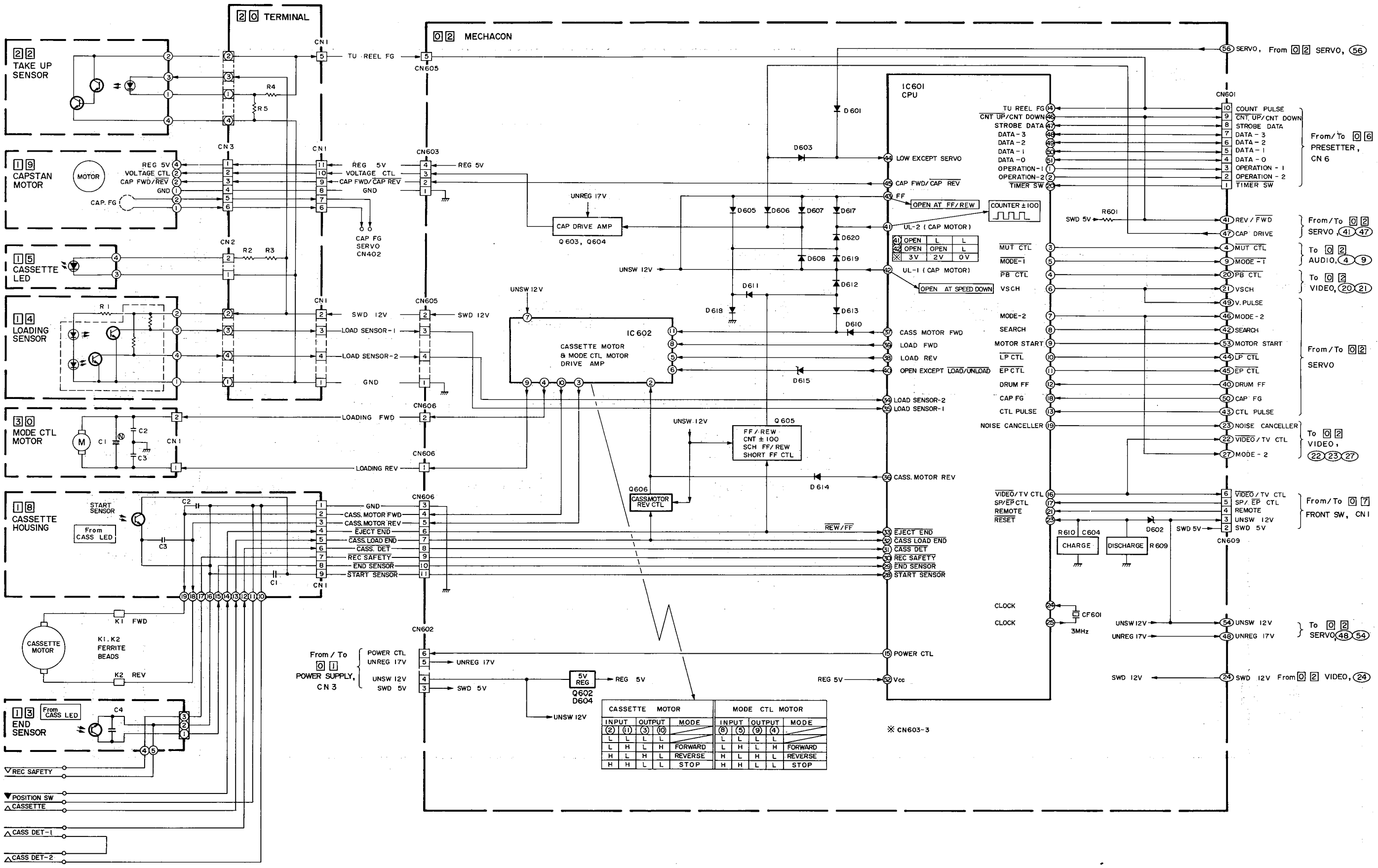
A	AC	: Alternating Current
	ACC	: Automatic Color Control
	A/CTL	: Audio/Control
	ADC	: Analog to Digital Converter
	ADD	: Adder
	ADJ	: Adjustment
	A DUB	: Audio Dubbing
	AE	: Audio Erase
	AEF	: Automatic Editing Function
	AFC	: Automatic Frequency Control
	AFT	: Automatic Fine Tuning
	AGC	: Automatic Gain Control
	AH	: Audio Head
	AHD	: Audio High Density Disk
	AL	: After Loading
	ALC	: Automatic Light Compensation Automatic Level Control
	ALM	: Alarm
	ALU	: Arithmetic Logic Unit
	AM	: Amplitude Modulation
	AMP	: Amplifier
	ANT	: Antenna
	APC	: Automatic Pedestal Control Automatic Phase Control
	APL	: Average Picture Level
	A/S/M	: Audio/Servo/Mechacon
	ASS'Y	: Assembly
	ATT	: Attenuator
	AUD	: Audio
	AUTO	: Automatic
	AUX	: Auxiliary
B	B	: Base
	BAL	: Balance
	BATT	: Battery
	BBD	: Bucket Brigade Device
	BCD	: Binary Coded Decimal
	BEG	: Beginning
	BFP	: Burst Flag Pulse
	BIT	: Binary Digit
	BLK	: Black, Blanking
	BLU	: Blue
	BNC	: Bayonet Connector
	BOT	: Beginning of Tape
	BPF	: Bandpass Filter
	BRK	: Brake
	BRN	: Brown
	BRT	: Brightness
	BT	: Band Tuning
	BUFF	: Buffer
	BW or B/W	: Black and White
C	C	: Capacitance, Collector, Color
	CAL	: Calibration
	CAP	: Capstan, Capacitor
	CAR	: Carrier
	CARR	: Carrier
	CASS	: Cassette
	CC	: Cassette Compartment
	CCD	: Charge Coupled Device
	CCT	: Circuit
	CdS	: Cadmium Sulphide
	CD	: Count Down
	CE	: Chip Enable
	CF	: Ceramic Filter, Color Frame
	CH	: Channel
	CHG	: Charge
	CHROMA	: Chrominance
	CLK	: Clock
	CLR	: Clear
	CMD	: Command
	CMOS	: Complementary Metal Oxide Semiconductor
	CNT	: Count, Counter
	COL	: Color
	COM	: Common
	COMB	: Combination Comb Filter
	COMP	: Comparator Composite Compensation
	CONN	: Connector
	CONV	: Converter
	CP	: Circuit Protector Clamp Pulse
	CPC	: Capstan Phase Control
	CPU	: Central Processing Unit
	CTC	: Crosstalk Cancel
	CTL	: Control
D	D	: Drum, Digital, Diode, Drain
	DAC	: Digital to Analog Converter
	dB	: Decibel
	DC	: Direct Current
	DD	: Direct Drive
	DEC	: Decoder
	DEMOD	: Demodulator
	DEMUX	: Demultiplexer
	DET	: Detector
	DEV	: Deviation
	DFRS	: Drum Free Running Stop
	DG	: Differential Gain
	DIF	: Differential
	DISCR	: Discriminator
	DL	: Delay Line
	DOC	: Dropout Compensator
	DOD	: Drop Out Detector
	DP	: Differential Phase
	DPC	: Drum Phase Control
	DYAC	: Dynamic Aperture Control
E	E	: Edit, Emitter
	EDP	: Electronic Data Processing
	E-E	: Electric to Electric
	EF	: Emitter-Follower
	EMP	: Emphasis
	EN	: Enable
	ENC	: Encoder
	ENV	: Envelope
	EOT	: End of Tape
	EP	: Extended Play
	EQ	: Equalizer
	ES	: Electronic Switch
	ESNS	: End Sensor
	EXP	: Expander
	EXT	: External
F	F	: Farad, Fuse
	F ADV	: Frame Advance
	FDP	: Fluorescent Display Panel
	FE	: Full Erase
	FET	: Field Effect Transistor
	FF	: Fast Forward Flipflop
	FG	: Frequency Generator
	FM	: Frequency Modulation
	FMA	: FM Audio
	FR	: Full Recording, Frame, Fusible Resistor
	FREQ	: Frequency
	F-V CONV	: Frequency to Voltage Converter
	FWD	: Forward
	FWD S	: Forward Search
G	G	: Green, Gate, Grid
	GEN	: Generator
	GND	: Ground
	GRN	: Green
	GRY	: Gray
H	H	: High, Henry, Hour
	HBF	: Horizontal Burst Flag
	HD	: Horizontal Drive
	HG	: Hall Generator
	HPF	: Highpass Filter
	Hz	: Herz

I	IC	: Integrated Circuit
	ID	: Identification (Pulse)
	IF	: Intermediate Frequency
	IFR	: Infrared
	IFT	: Intermediate Frequency Transformer
	IND	: Indicator
	INH	: Inhibit
	INS	: Insert
	INT	: Internal, Interrupt
	INV	: Inverter
	I/O	: Input/Output
	IR	: Infrared
L	L	: Low, Left
	LCD	: Liquid Crystal Display
	LED	: Light Emitting Diode
	LIM	: Limiter
	LIN	: Linearity
	LOAD	: Loading (Cassette)
	LP	: Long Play
	LPF	: Lowpass Filter
	LSB	: Lower Sideband
M	M	: Motor, Mega
	MAX	: Maximum
	MDA	: Motor Drive Amplifier
	MECHACON	: Mechanism Control
	MIC	: Microphone
	MIN	: Minimum
	MIX	: Mixer, Mixing
	MMV	: Monostable Multivibrator
	MNOS	: Metal Nitride Oxide Semiconductor
	MOD	: Modulation, Modulator
	MODEM	: Modulator-Demodulator
	MON	: Monitor
	MOS	: Metal Oxide Semiconductor
	MPX	: Multiplexer, Multiplex
	MS	: Mode Select
	MUT	: Muting
N	NAND	: Not-And
	NC	: Not Connected, Normally Closed
	NFB	: Negative Feedback
	NLN	: Non-Linear
	NO	: Normally Open
	NOR	: Normal, Not-Or
	NR	: Noise Reduction
O	OP	: Operation
	OPAMP	: Operational Amplifier
	ORN	: Orange
	OSC	: Oscillator
P	PB	: Playback
	PC	: Photocoupler, Pulse Counter
	PCM	: Pulse Code Modulation
	PG	: Pulse Generator
	PGM	: Program
	PI	: Photo Interrupter
	PIF	: Picture Intermediate Frequency
	PLA	: Programmable Logic Array
	PLL	: Phase Locked Loop
	POS	: Position
	p-p	: Peak-to-Peak
	PR	: Pinch Roller
	PREAMP	: Preamplifier
	PRL	: Preroll
	P/S	: Pause/Still
	PSC	: Pulse Swallowing Control
	PU	: Pickup
	PUT	: Programmable Unijunction Transistor
	PWB	: Printed Wiring Board
	PWM	: Pulse Width Modulation
	PWR	: Power
Q	Q	: Quality Factor
R	R	: Red, Right
	RA	: Resistor Array
	RAM	: Random Access Memory
	REC	: Recording
	REF	: Reference
	REG	: Regulated, Regulator
	REM	: Remote
	REMOCON	: Remote Control (Unit)
	REV	: Reverse
	REV S	: Reverse Search
	REW	: Rewind
	RF	: Radio Frequency
	ROM	: Read Only Memory
	R/P	: Record/Playback
	RPT	: Repeat
	RS FF	: RS Flipflop
	RST	: Reset
	RT	: Rotary Transformer
	RUN	: Running
	RY	: Relay
S	SAW	: Sawtooth, Surface Acoustic Wave
	SC	: Subcarrier, Simulcast
	SCH	: Search
	SEL	: Select, Selector
	SENS	: Sensor
	SEP	: Separator
	SF	: Source Follower
	SFF	: Short Fast Forward
	SIF	: Sound Intermediate Frequency
	SN	: Signal to Noise Ratio
	SOL	: Solenoid
	SOS	: Sound on Sound
	SP	: Standard Play
	SR	: Supply Reel
	SREV	: Search Reverse
	SREW	: Short Rewind
	S/S	: Slow/Still
	SSG	: Sync Signal Generator
	SSNS	: Start Sensor
	STD	: Strobe Data, Standard
	SUP	: Supply
	SW	: Switch
	SWD	: Switched
	SYNC	: Synchronization
	SYSCON	: System Control
T	TAL	: Tally
	TBC	: Time Base Corrector
	TC	: Tension Control, Time Code
	TEN	: Tension
	TF	: Thermal Fuse
	TIM	: Timing
	TK	: Tracking
	TNR	: Tuner
	TP	: Test Point
	TPZD	: Trapezoid
	TR	: Transistor, Trimmer
	TRANS	: Transformer
	T/T	: Tuner/Timer
	TU	: Take-up
U	UL	: Unloading
	UNREG	: Unregulated
	UNSW	: Unswitched
V	V	: Vertical, Volt
	VACT	: Video Action
	VCO	: Voltage Controlled Oscillator
	VD	: Vertical Drive
	VIF	: Video Intermediate Frequency
	VLT	: Violet
	VR	: Variable Resistor
	VS	: Video and Sync
	VSCH	: Variable Search
	V/T	: Video/Television
	V/U	: VHF/UHF
	VXO	: Variable Crystal Oscillator
W	W	: Watt
	WARN	: Warning
	W & D	: White and Dark
	WHT	: White
	WV	: Working Voltage
X	XTAL	: Crystal
Y	Y	: Luminance
	YEL	: Yellow

4.3 AUDIO BLOCK DIAGRAM



4.4 MECHANISM CONTROL BLOCK DIAGRAM

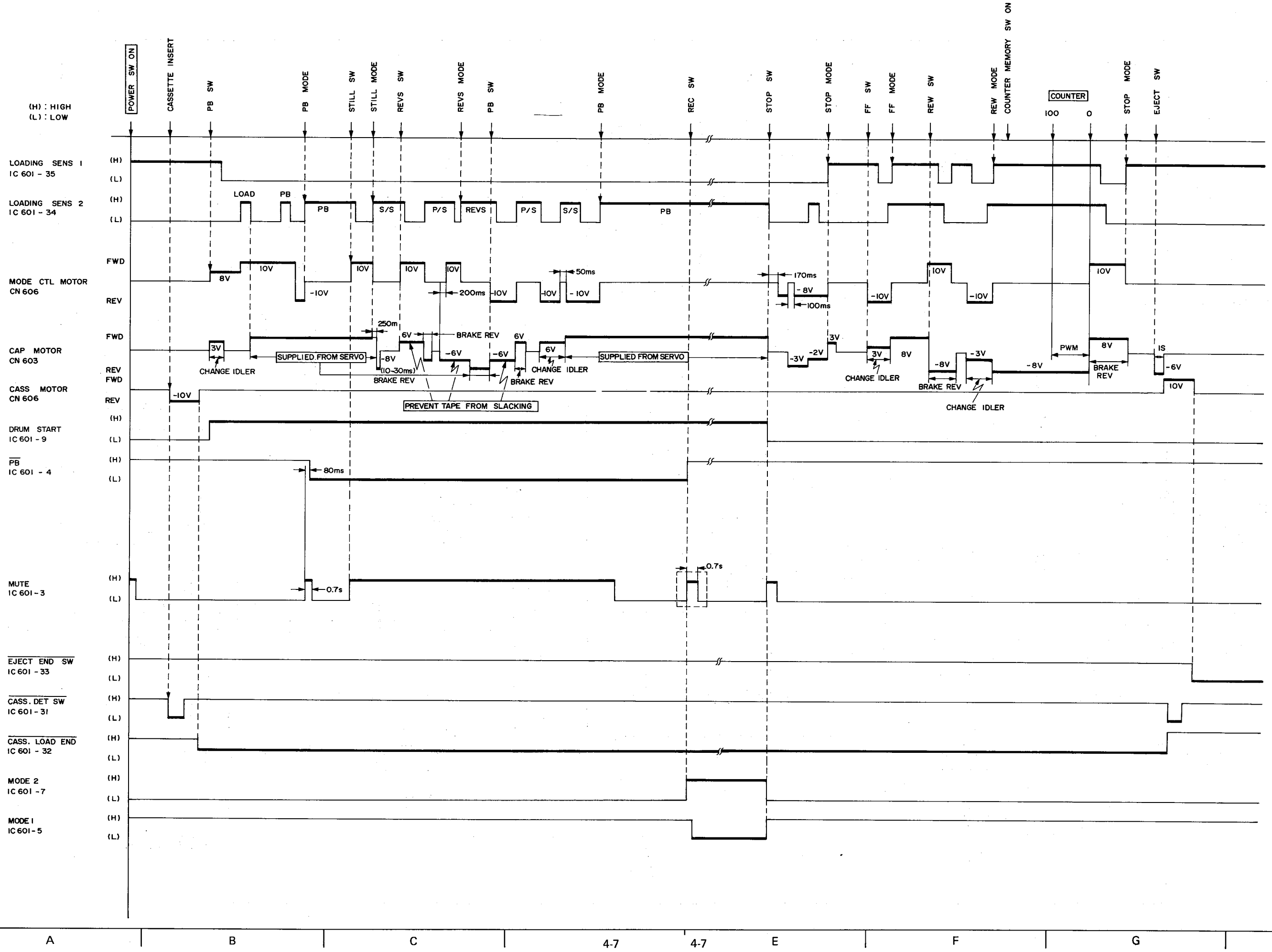


CASSETTE MOTOR				
INPUT (2)	INPUT (11)	OUTPUT (3)	OUTPUT (10)	MODE
L	L	L	L	
L	H	L	H	FORWARD
H	L	H	L	REVERSE
H	H	L	L	STOP

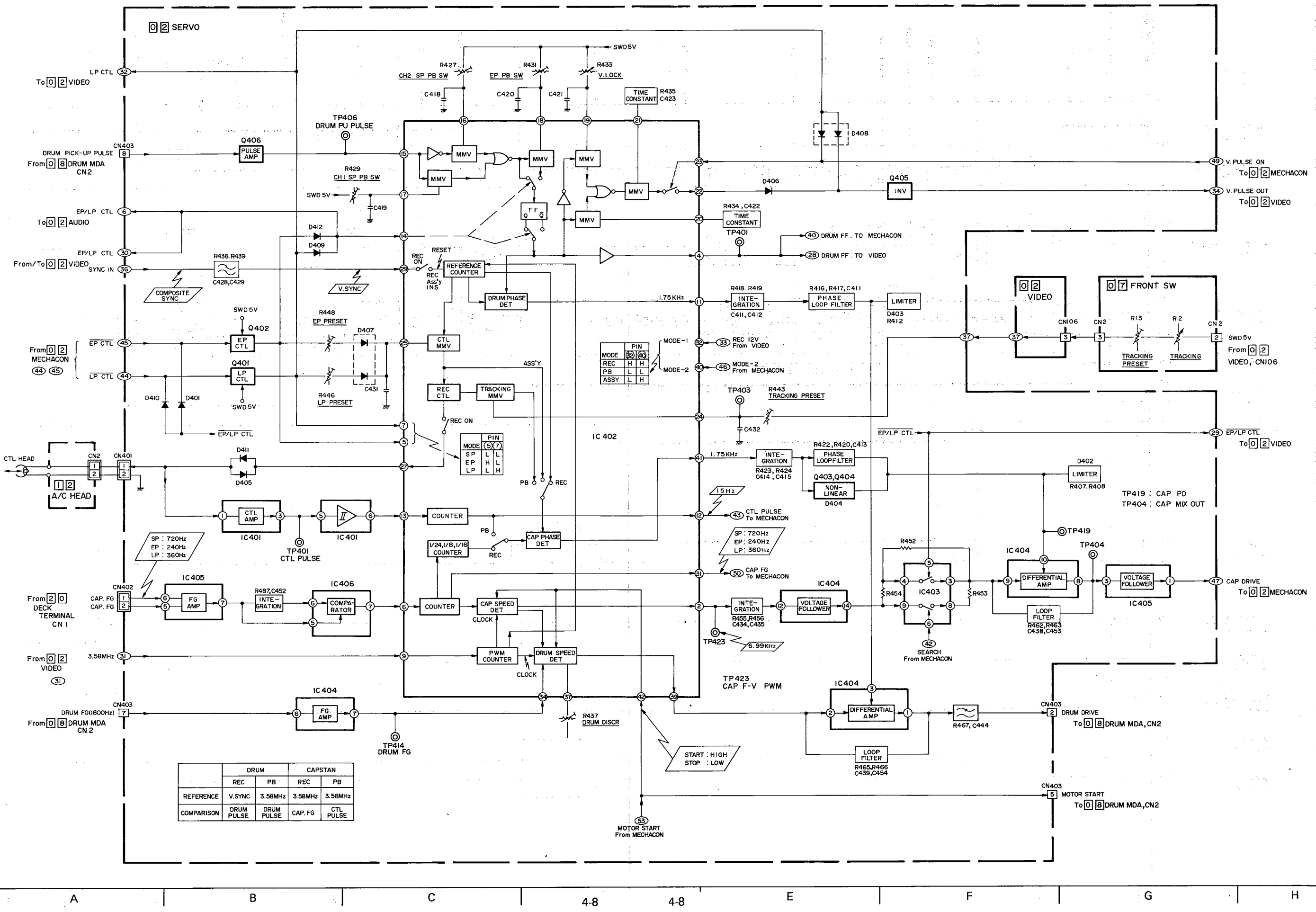
MODE CTL MOTOR				
INPUT (8)	INPUT (5)	OUTPUT (9)	OUTPUT (4)	MODE
L	L	L	L	
L	H	L	H	FORWARD
H	L	H	L	REVERSE
H	H	L	L	STOP

※ CN603-3

4.5 MECANISM CONTROL TIMING CHARTS



4.6 SERVO BLOCK DIAGRAM

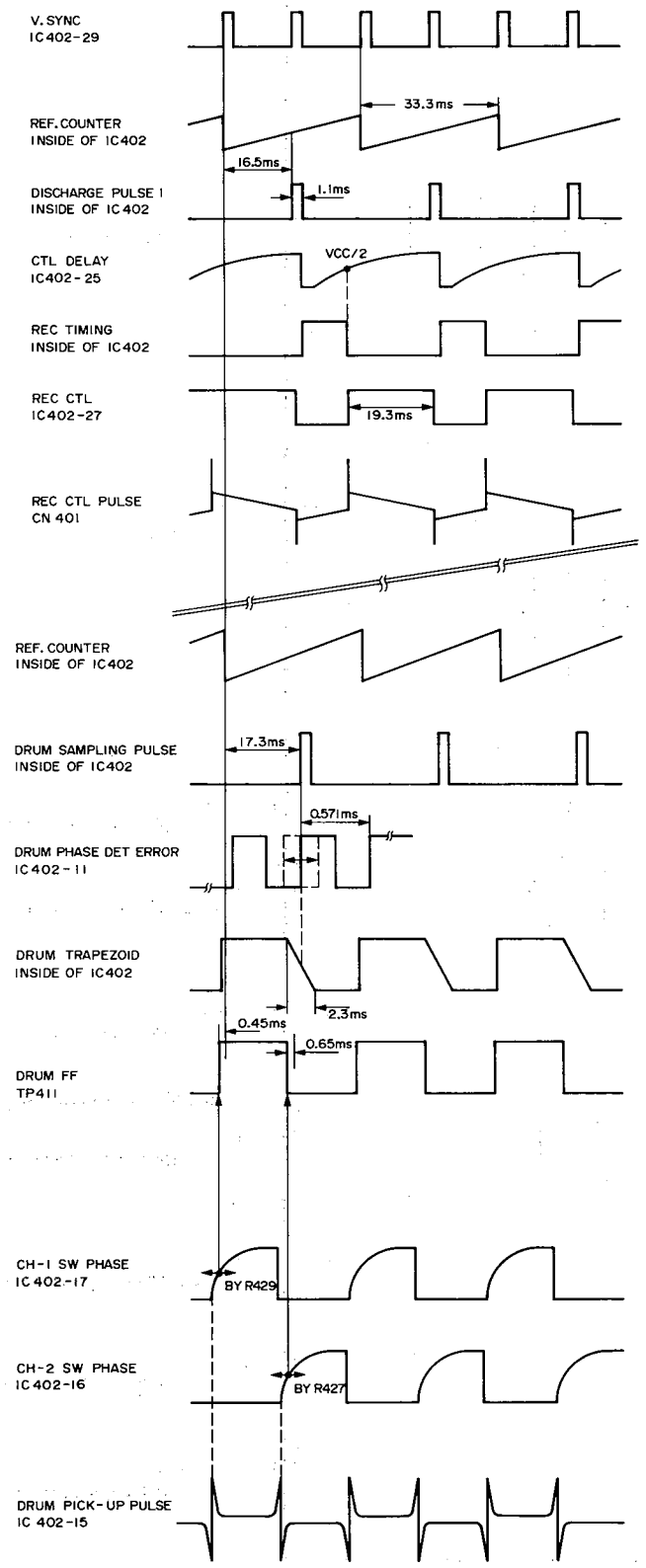


	DRUM		CAPSTAN	
	REC	PB	REC	PB
REFERENCE	V.SYNC	3.58MHz	3.58MHz	3.58MHz
COMPARISON	DRUM PULSE	DRUM PULSE	CAP. FG	CTL PULSE

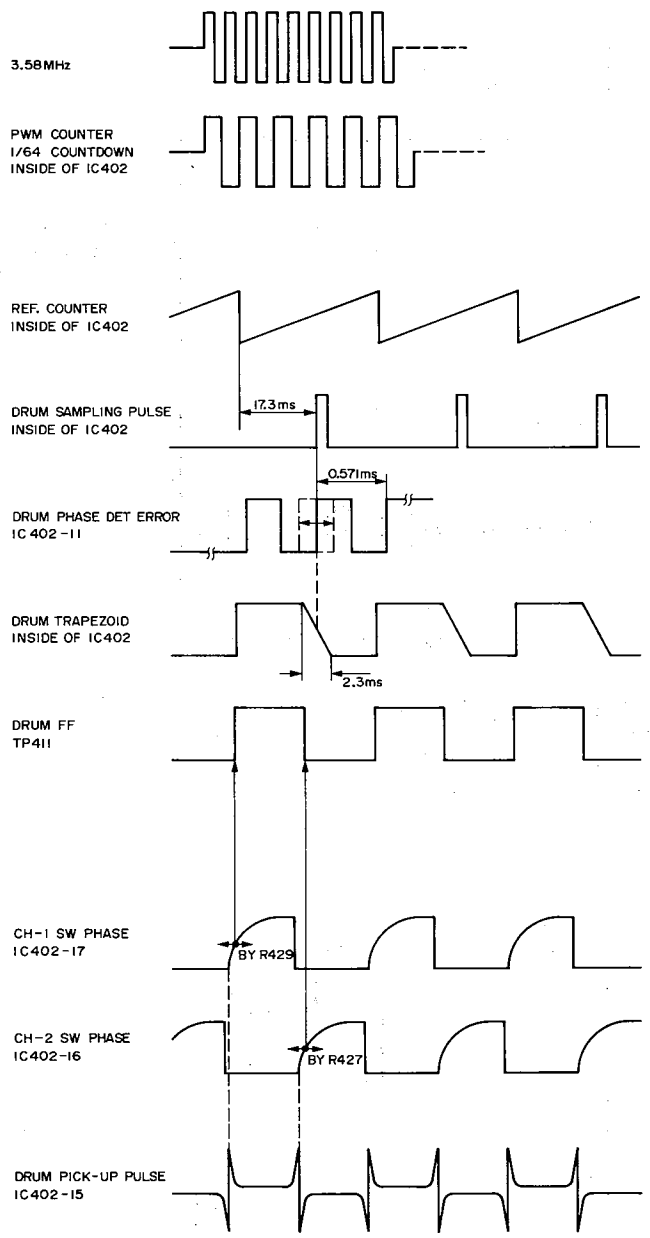
4.7 SERVO TIMING CHARTS

DRUM SERVO

RECORDING

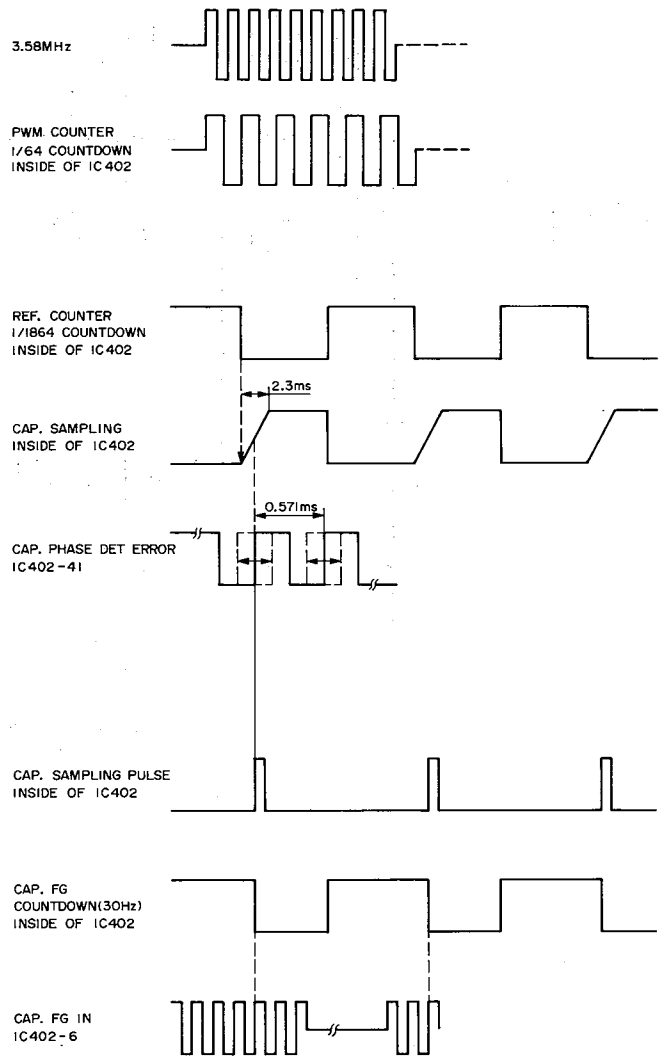


PLAYBACK

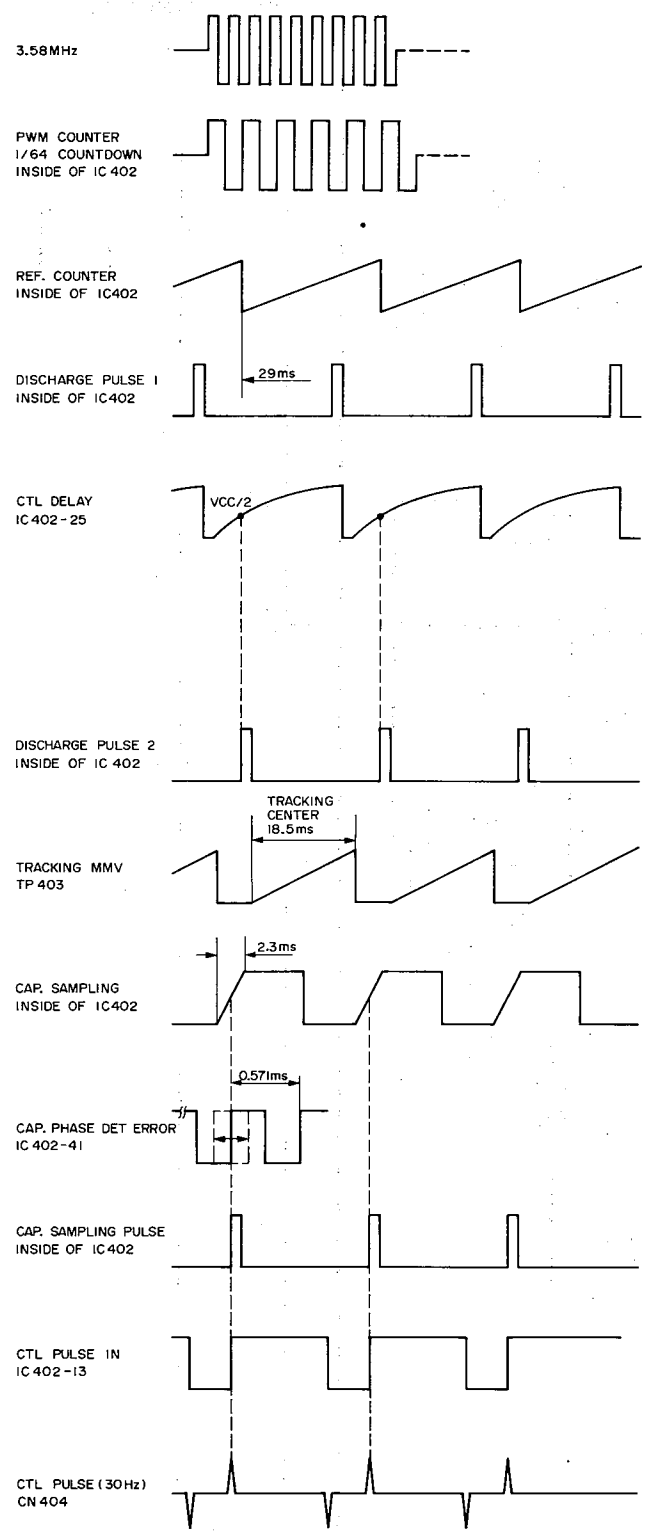


CAPSTAN SERVO

RECORDING

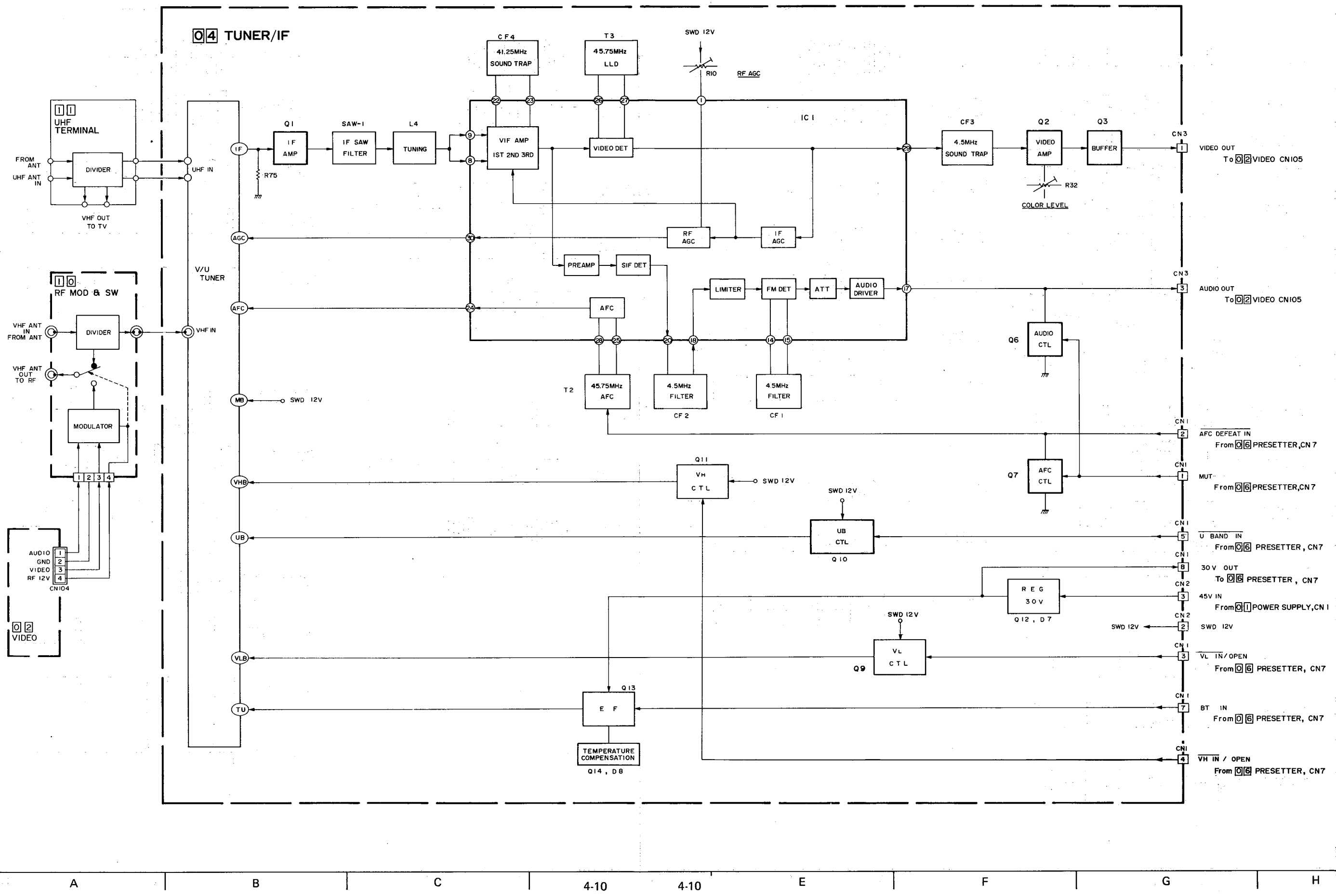

3.58MHz
PWM COUNTER 1/64 COUNTDOWN INSIDE OF IC402
REF. COUNTER 1/1864 COUNTDOWN INSIDE OF IC402
2.3ms
CAP. SAMPLING INSIDE OF IC402
0.571ms
CAP. PHASE DET ERROR IC402-41
CAP. SAMPLING PULSE INSIDE OF IC402
CAP. FG COUNTDOWN(30Hz) INSIDE OF IC402
CAP. FG IN IC402-6

PLAYBACK

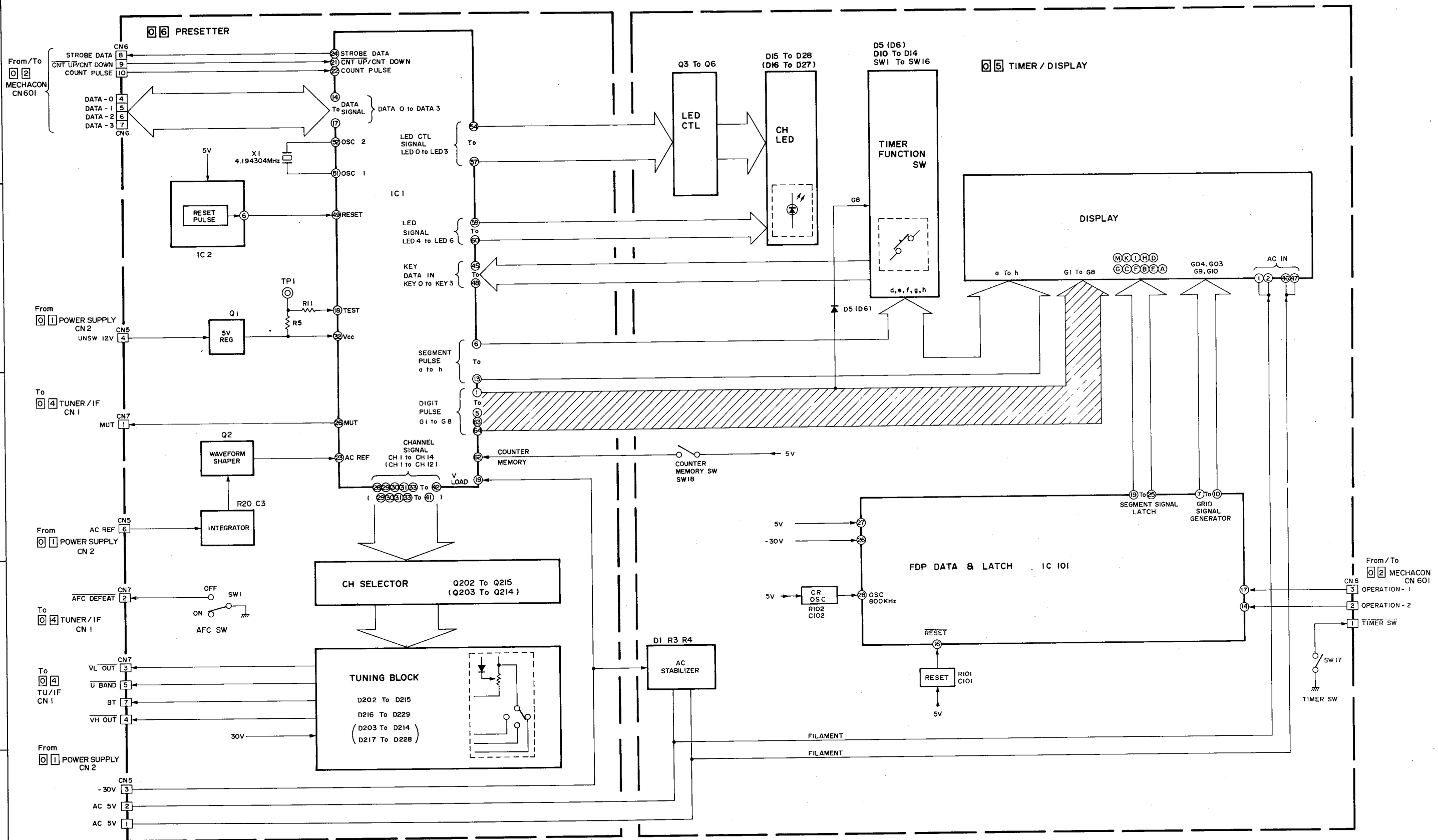


4-9

4.8 TUNER/IF BLOCK DIAGRAM

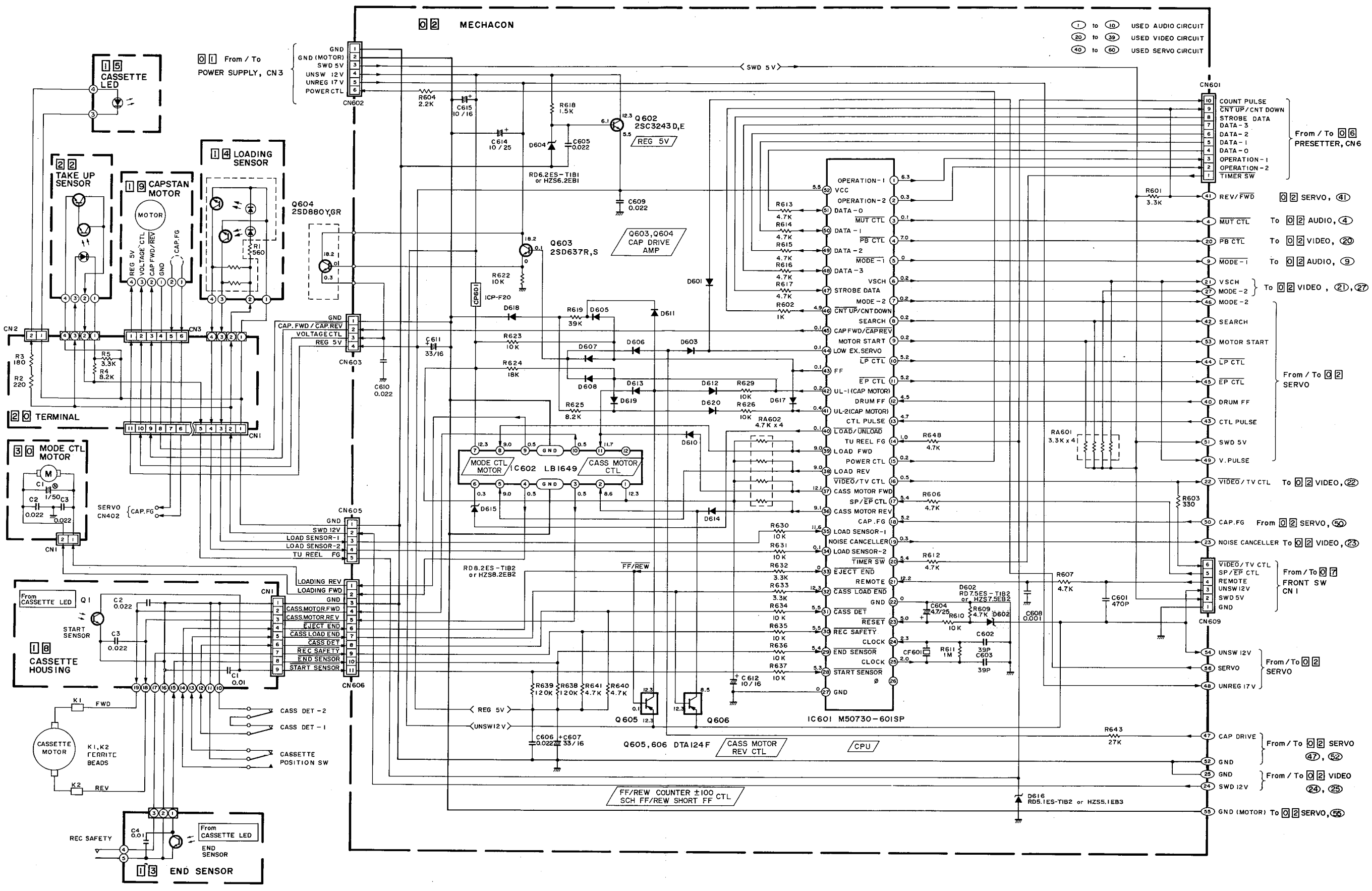


4.11 TIMER DISPLAY/PRESETTER BLOCK DIAGRAMS



NOTE:
Where symbol differs between the HR-D150U/UC model and the HR-D151U/UC model, the symbol of the HR-D151U/UC model is shown in parentheses.

4.12 MECHANISM CONTROL SCHEMATIC DIAGRAM

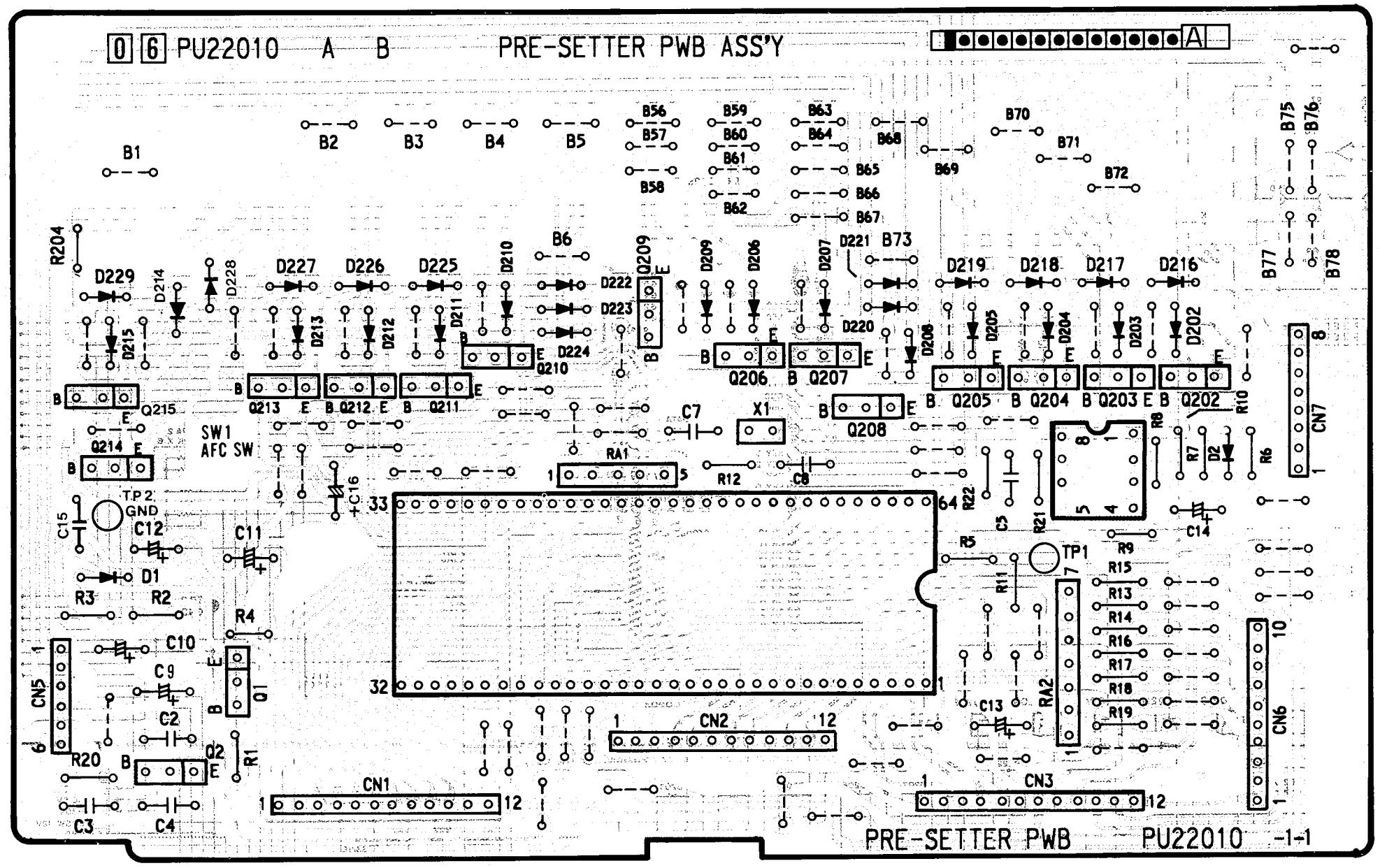


NOTES: Unless otherwise specified.

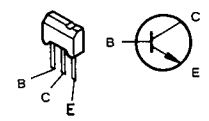
1. All resistance values are in ohms. (1/6 W).
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. All diodes are MA165.
5. Voltages are DC-measured with a digital voltmeter during stop mode.
6. Shaded ( ) parts are critical for safety. Replace only with specified part numbers.

4.21 PRESETTER CIRCUIT BOARD (HR-D150U/UC)

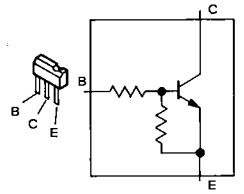
– PRESETTER –



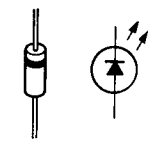
2SD638



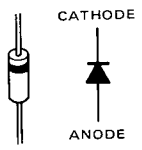
DTC114F
DTC144WF



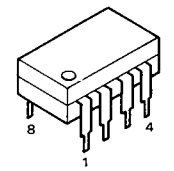
LTZ-R15



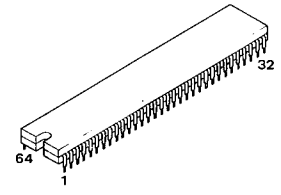
1SS132
1SS133



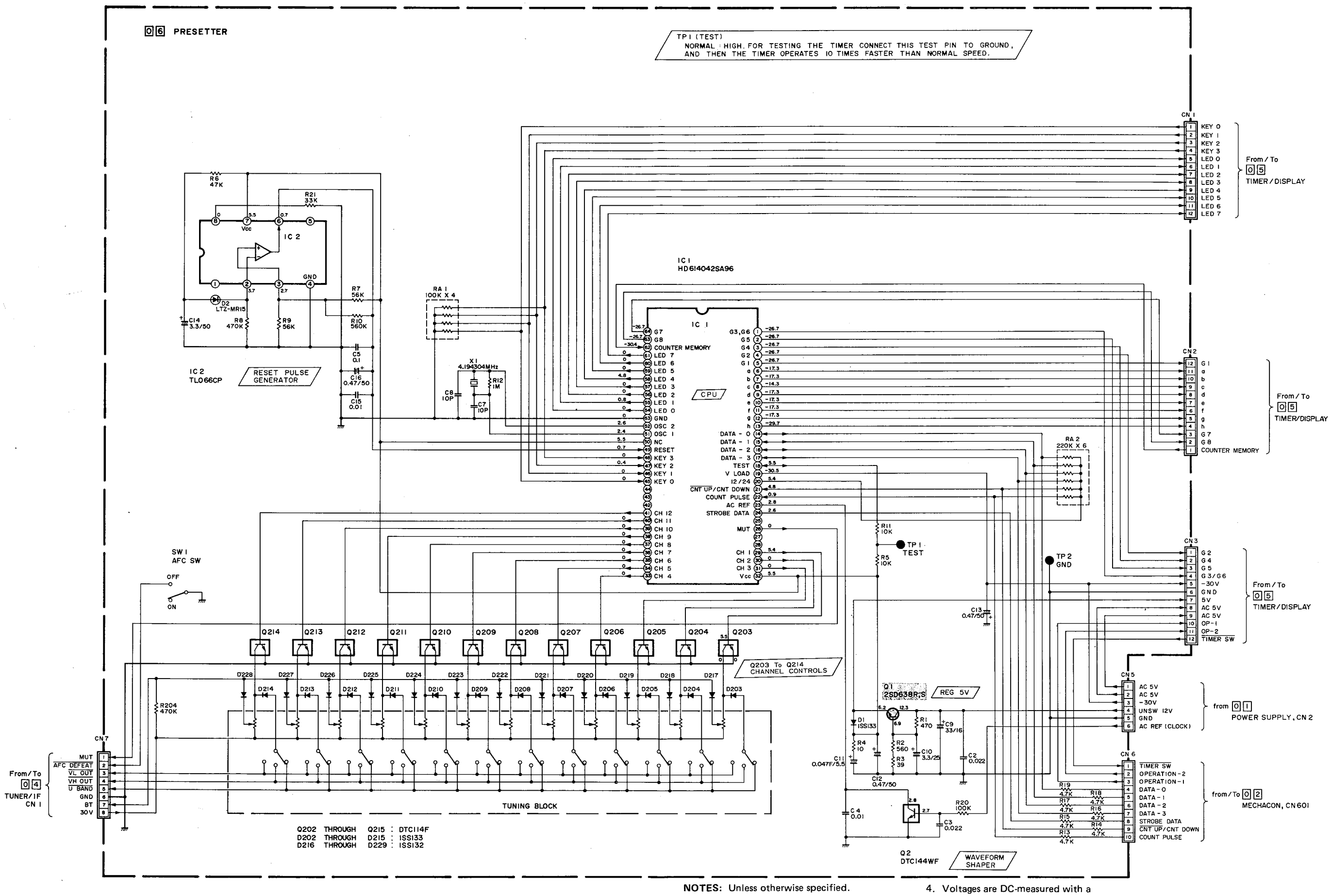
TL066CP



HD614042SA96



4.22 PRESETTER SCHEMATIC DIAGRAM (HR-D151U/UC)

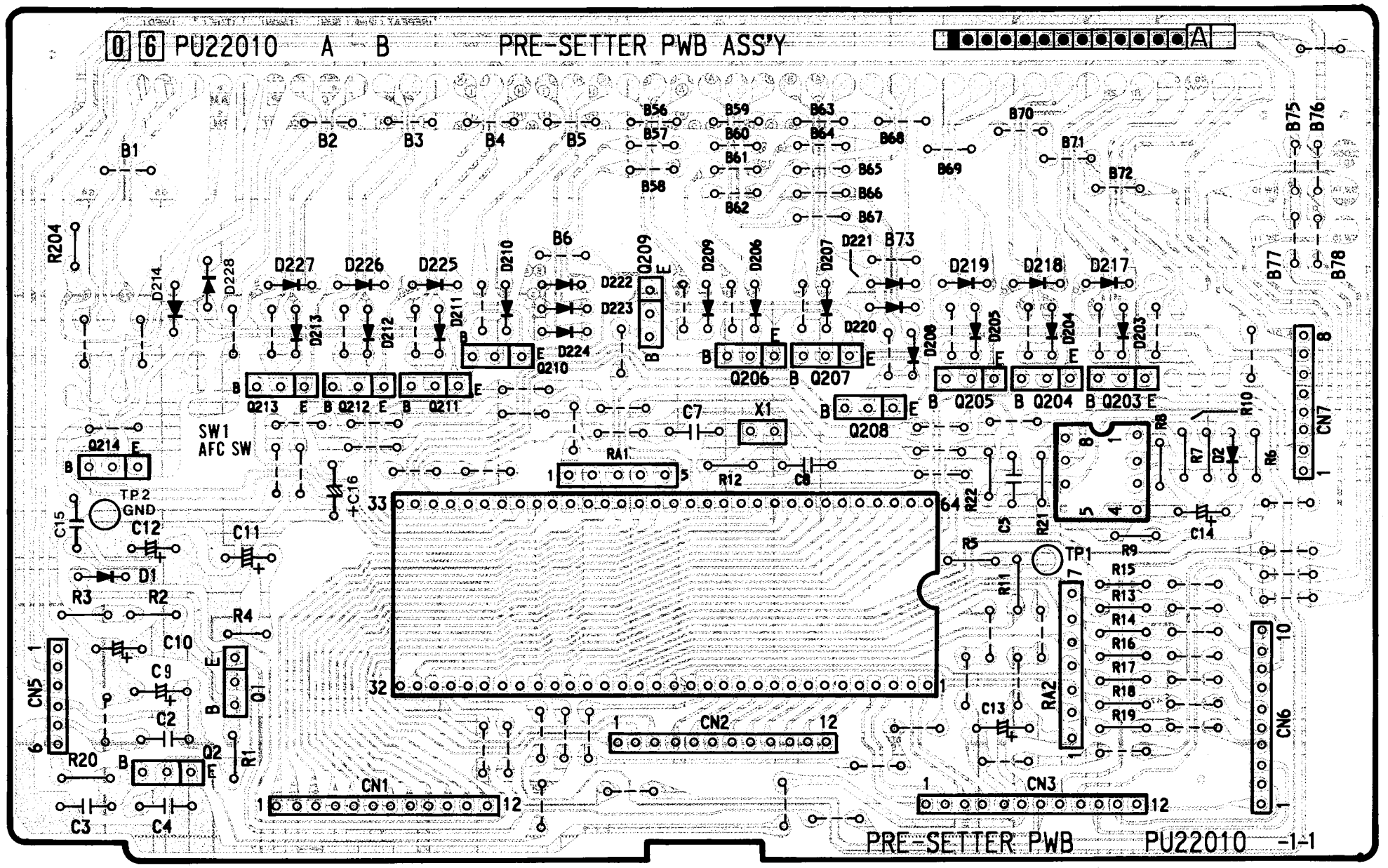


NOTES: Unless otherwise specified.

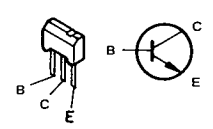
1. All resistance values are in ohms (1/6 W)
2. All capacitance values are in μF.
3. All diodes are 1SS133.
4. Voltages are DC-measured with a digital voltmeter during stop mode.
5. Shaded ( ) parts are critical for safety. Replace only with speicfied part numbers.

4.23 PRESETTER CIRCUIT BOARD (HR-D151U/UC)

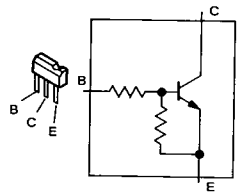
– PRESETTER –



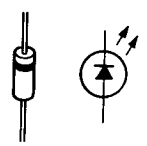
2SD638



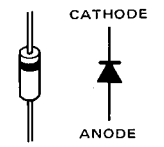
DTC114F
DTC144WF



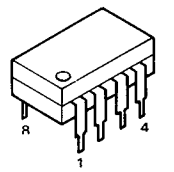
LTZ-R15



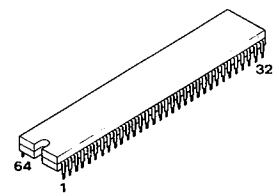
1SS132
1SS133



TL066CP



HD614042SA96



4.24 TIMER/DISPLAY SCHEMATIC DIAGRAM (HR-D150U/UC)

05 TIMER / DISPLAY

LED CTL

Q3 To Q6 : 2SD637R

PLAY	REC	FF	REW	PAUSE

REC PAUSE	FF SEARCH	REV SEARCH	A DUB	A DUB PAUSE

FDP
PU57435-2

From/To 06 PRESETTER CN 1: KEY 0, KEY 1, KEY 2, KEY 3, LED 0, LED 1, LED 2, LED 3, LED 4, LED 5, LED 6, LED 7

From/To 06 PRESETTER CN 2: G1, a, b, c, d, e, f, g, h, G7, G8, COUNTER MEMORY

From/To 06 PRESETTER CN 3: G2, G4, G5, G3/G6, -30V, GND, 5V, AC 5V, AC 5V, OP-1, OP-2, TIMER SW

SW13 CLOCK ADJ, SW7 START, SW3 DAY, SW14 CANCEL, SW10 LAP COUNTER, SW8 STOP, SW4 HOUR, SW15 REPEAT, SW11 RESET, SW9 PROGRAM, SW5 +MIN, SW1 CH UP, SW16 INSTANT REC, SW12 CLOCK, SW6 -MIN, SW2 CH DOWN, SW18 COUNTER MEMORY, SW17 TIMER SW

D5 : MA161
D10 To D14 : MA161
D15 To D28 : TLG113A

DATA & LATCH
IC101
MN1250BJA

TIMING GENERATOR, LATCH PULSE GENERATOR, SEGMENT SIGNAL LATCH, GRID SIGNAL GENERATOR, SHAPER, 4 BIT SHIFT REGISTER, 4 BIT LATCH, MPX, PLA, 8 BITS, 4 BITS

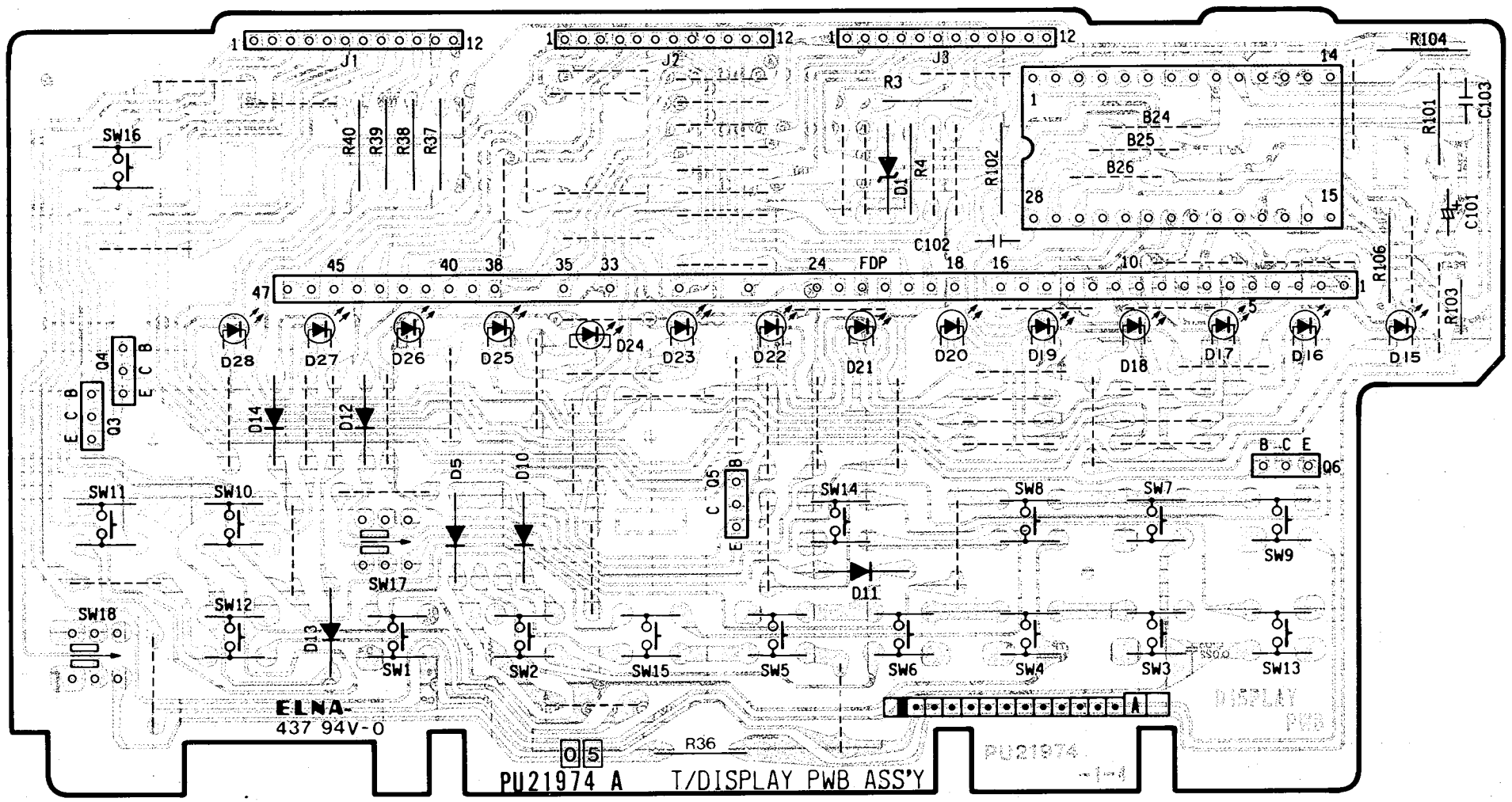
OSC, 5V, VPP (-30V), DIMMER, OP-1, RESET, GND, G04, G03, G9, G10, OP-2

NOTES: Unless otherwise specified.

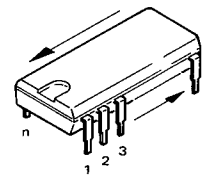
1. All resistance values are in ohms. (1/8 W)
2. All capacitance values are in μF.
3. All diodes are MA161.
4. Voltages are DC-measured with a digital voltmeter during stop mode.

4.25 TIMER/DISPLAY CIRCUIT BOARD (HR-D150U/UC)

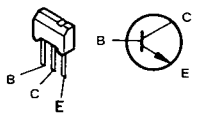
– TIMER/DISPLAY –



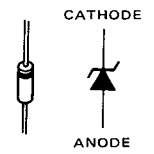
MN1250BJA



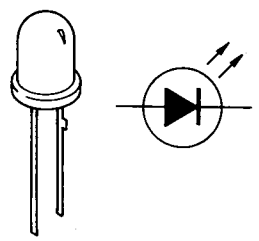
2SD637



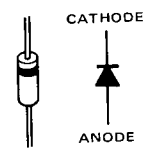
HZ7B



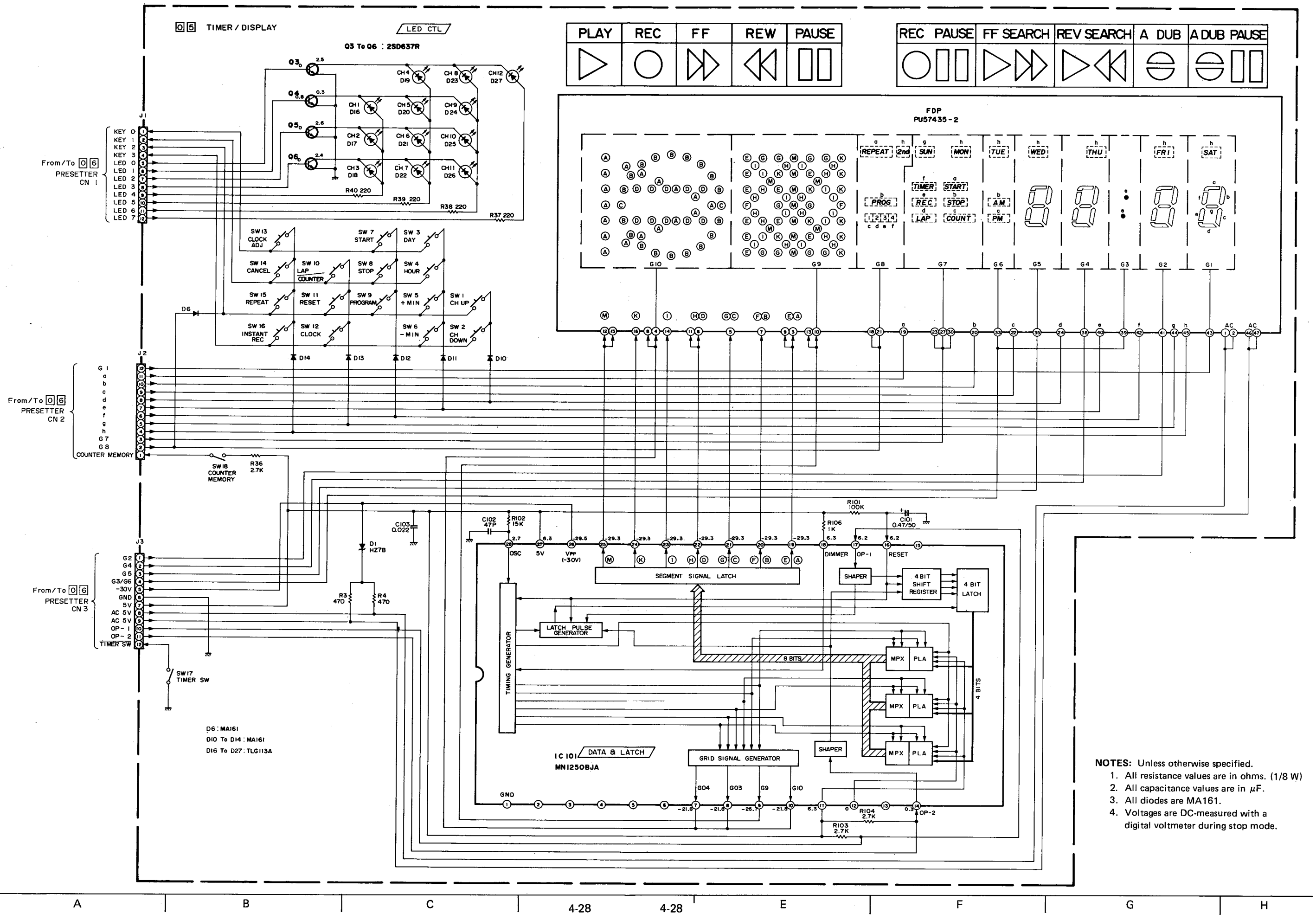
TLG-113A



MA161



4.26 TIMER/DISPLAY SCHEMATIC DIAGRAM (HR-D151U/UC)

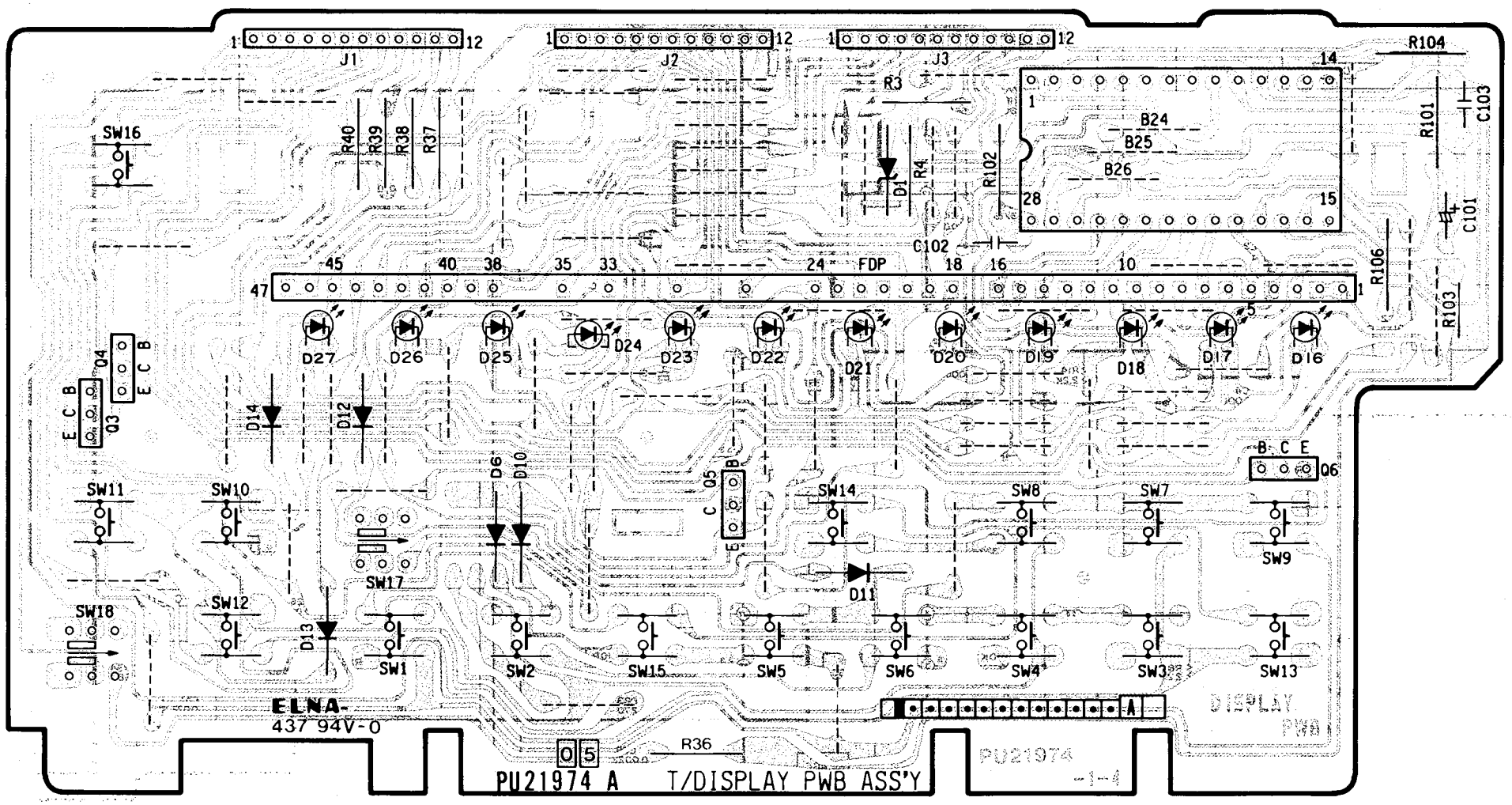


NOTES: Unless otherwise specified.

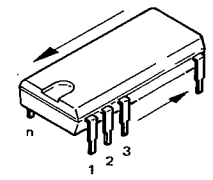
1. All resistance values are in ohms. (1/8 W)
2. All capacitance values are in μF.
3. All diodes are MA161.
4. Voltages are DC-measured with a digital voltmeter during stop mode.

4.27 TIMER/DISPLAY CIRCUIT BOARD

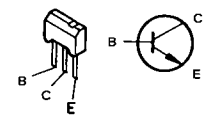
– TIMER/DISPLAY –



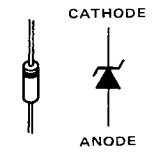
MN1250BJA



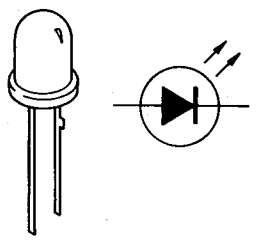
2SD637



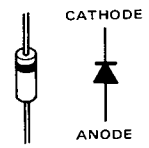
HZ7B



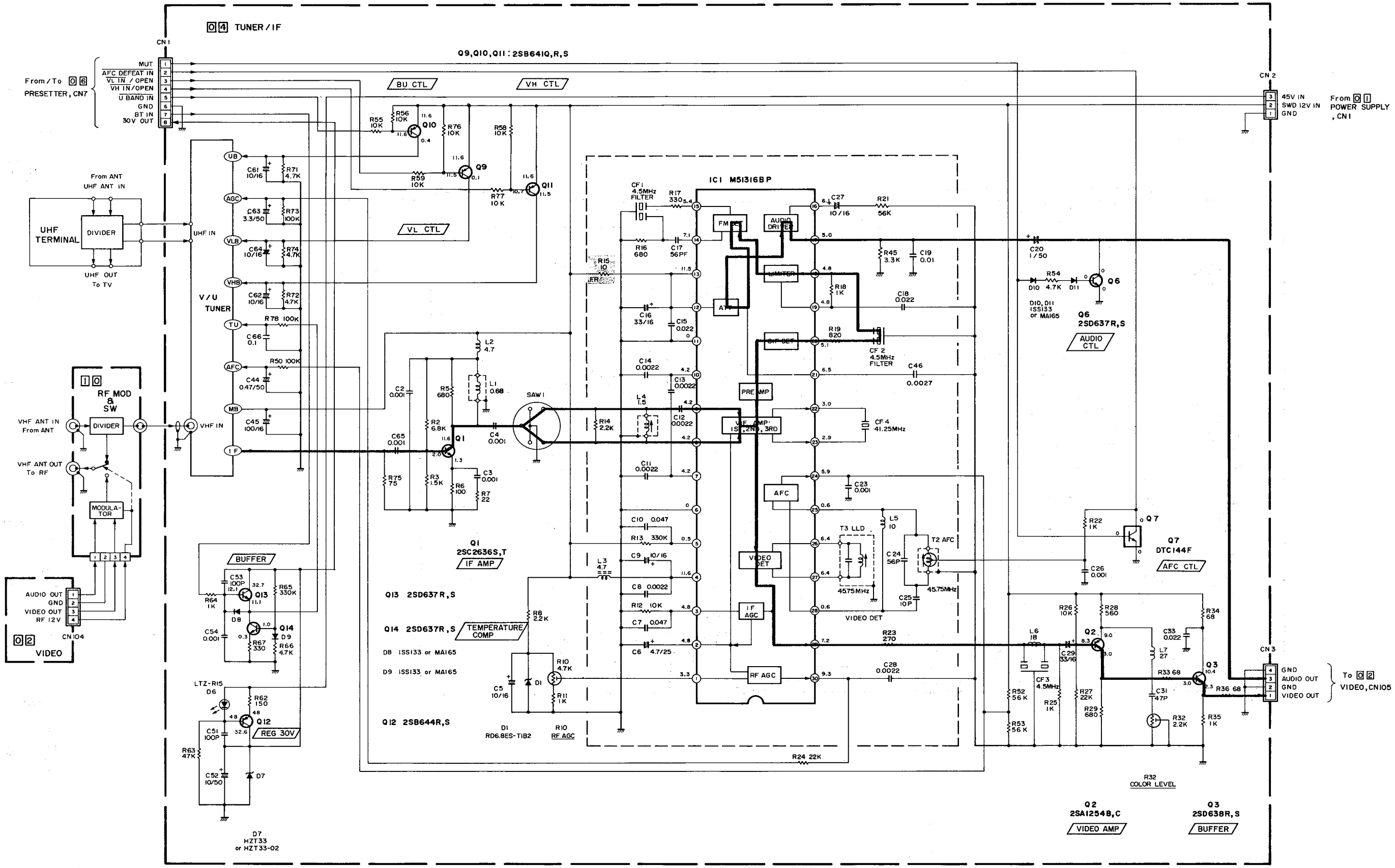
TLG-113A



MA161



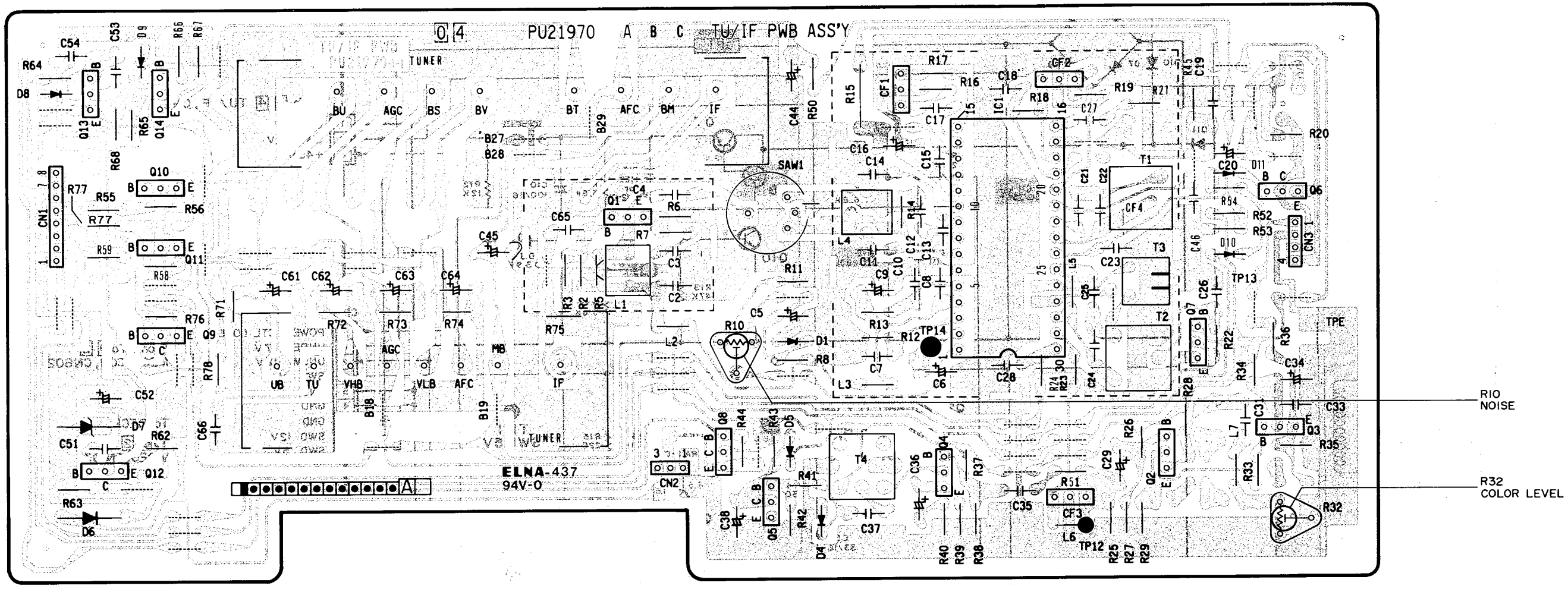
4.28 TUNER/IF SCHEMATIC DIAGRAM



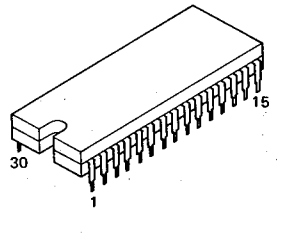
NOTES: Unless otherwise specified.

1. All resistance values are in ohms. (1/6 W).
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. Voltages are DC-emasured with a digital voltmeter during receiving a color broadcast.
5. All diodes are 1SS133 or MA165.
6. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

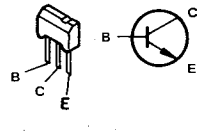
4.29 TUNER/IF CIRCUIT BOARD



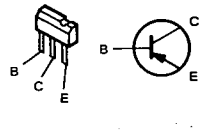
M51316BP



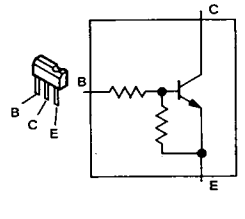
2SD637
2SD638
2SC2636



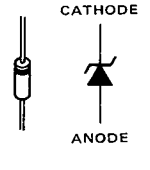
2SB644
2SB641
2SA1254



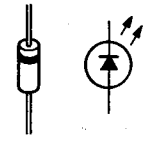
DTC144F



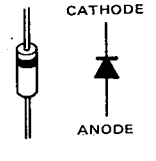
HZT33
RD6.8ES-TIB2



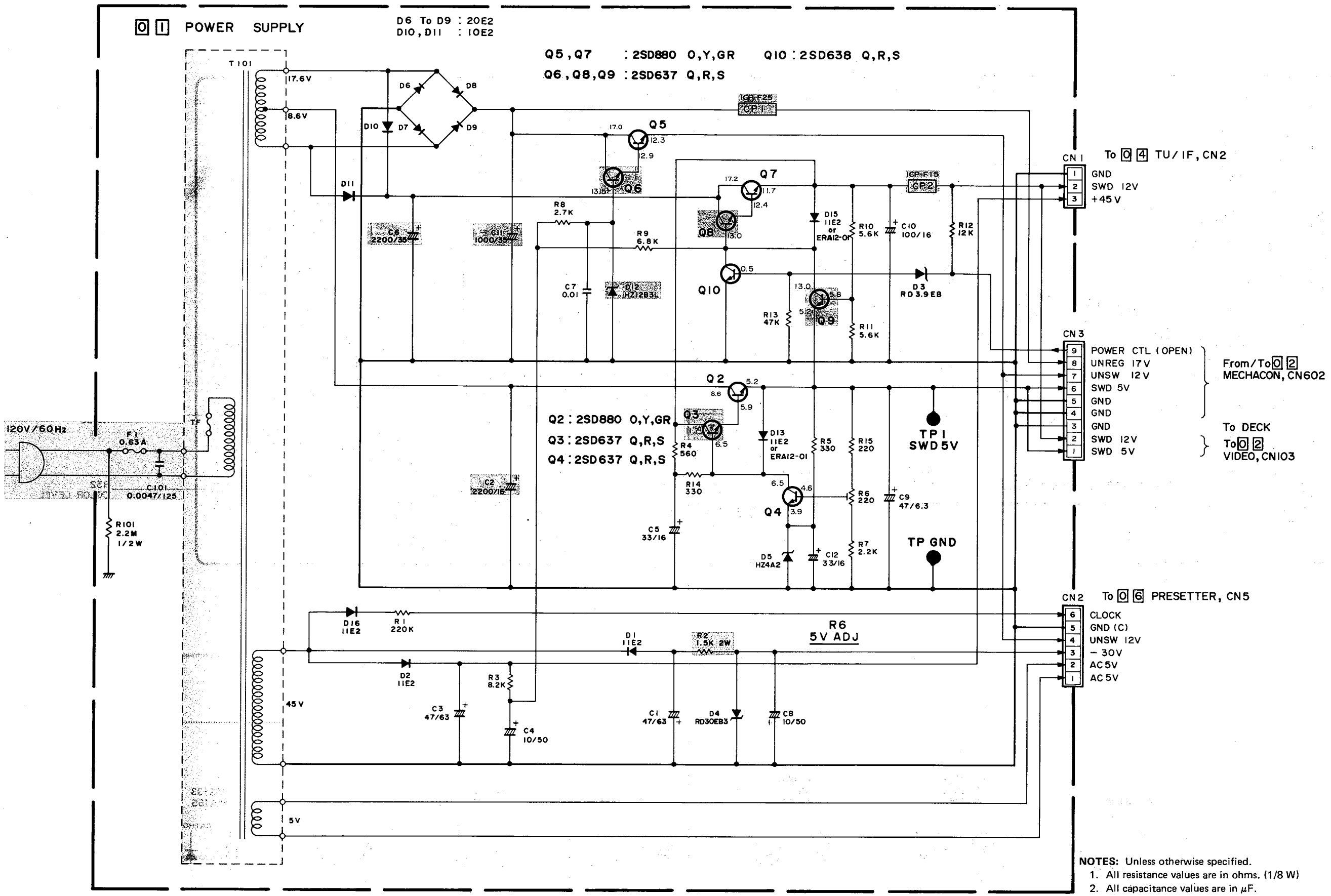
LTZ-R15



1SS133
MA165



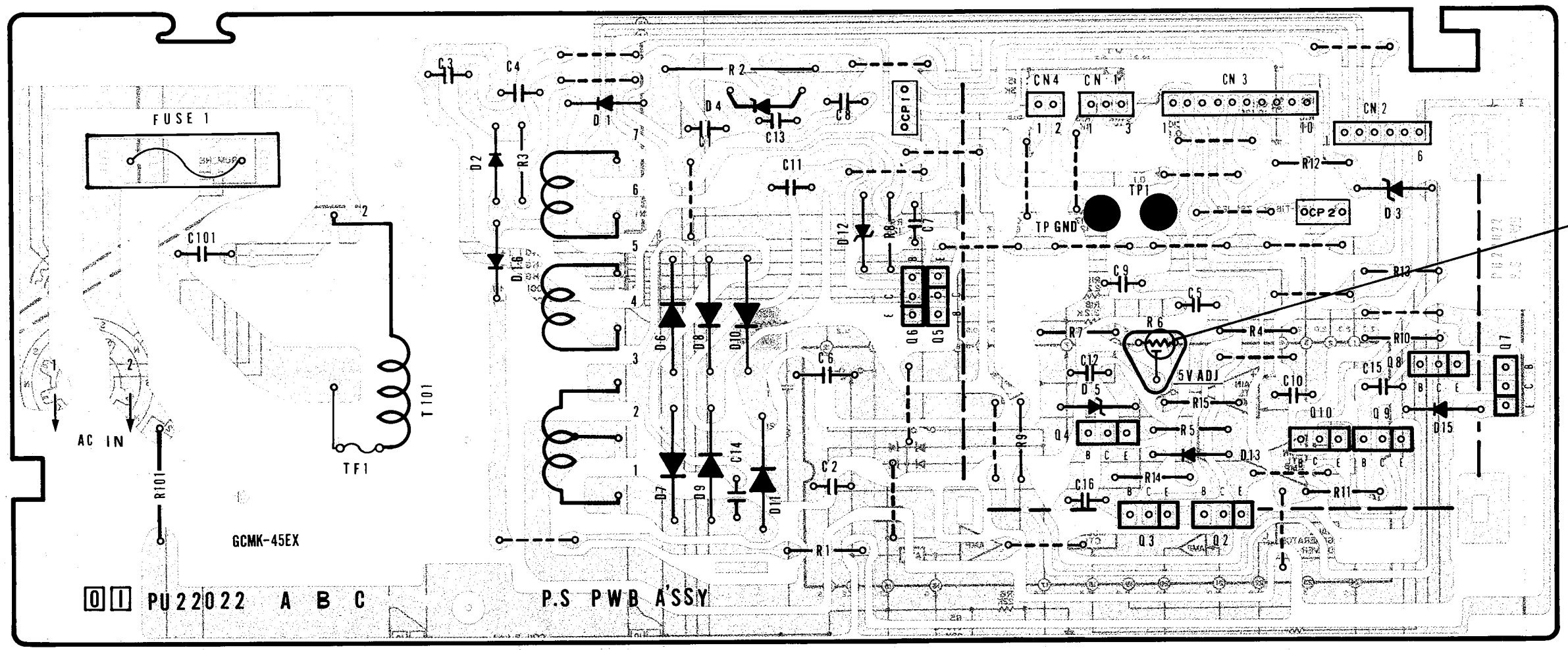
4.30 POWER SUPPLY SCHEMATIC DIAGRAM



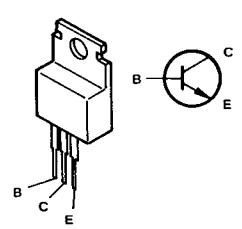
NOTES: Unless otherwise specified.

1. All resistance values are in ohms. (1/8 W)
2. All capacitance values are in μF.
3. Voltages are DC-measured with a digital voltmeter during stop mode.
4. Shaded ( ) parts are critical for safety. Replace only with specified part numbers.

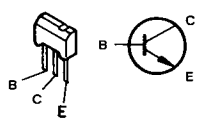
4.31 POWER SUPPLY CIRCUIT BOARD



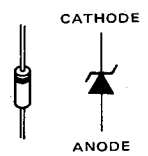
2SD880



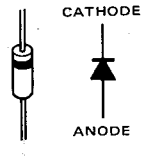
2SD638
2SD637



HZ12B3L
HZ4A2
RD30EB2
RD3.9EB

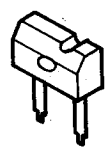


ERA12-01
10E2
20E2
11E2

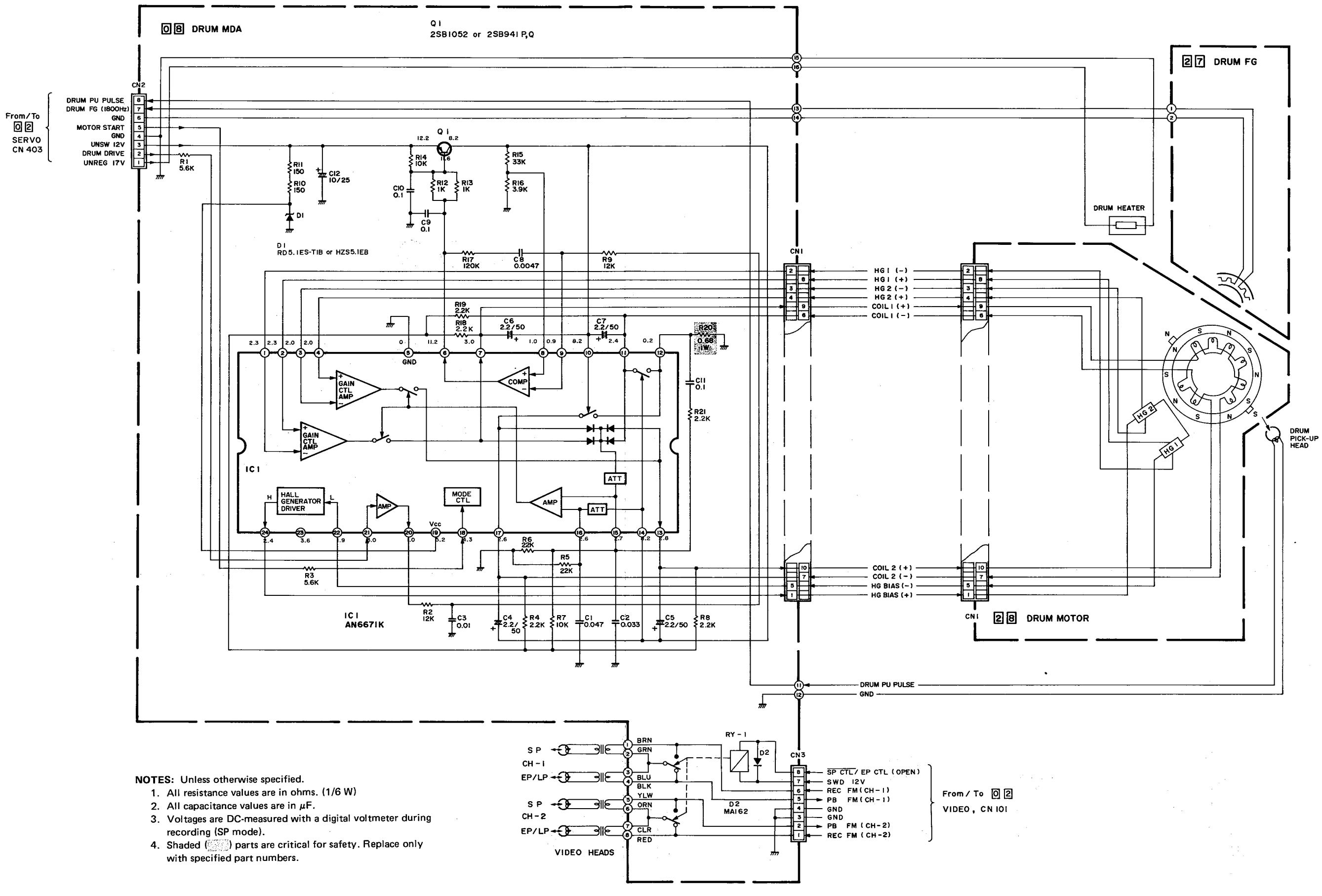


ICP-N15
ICP-N25

ICP-F15
ICP-F25



4.32 DRUM MDA, DRUM FG AND DRUM MOTOR SCHEMATIC DIAGRAMS

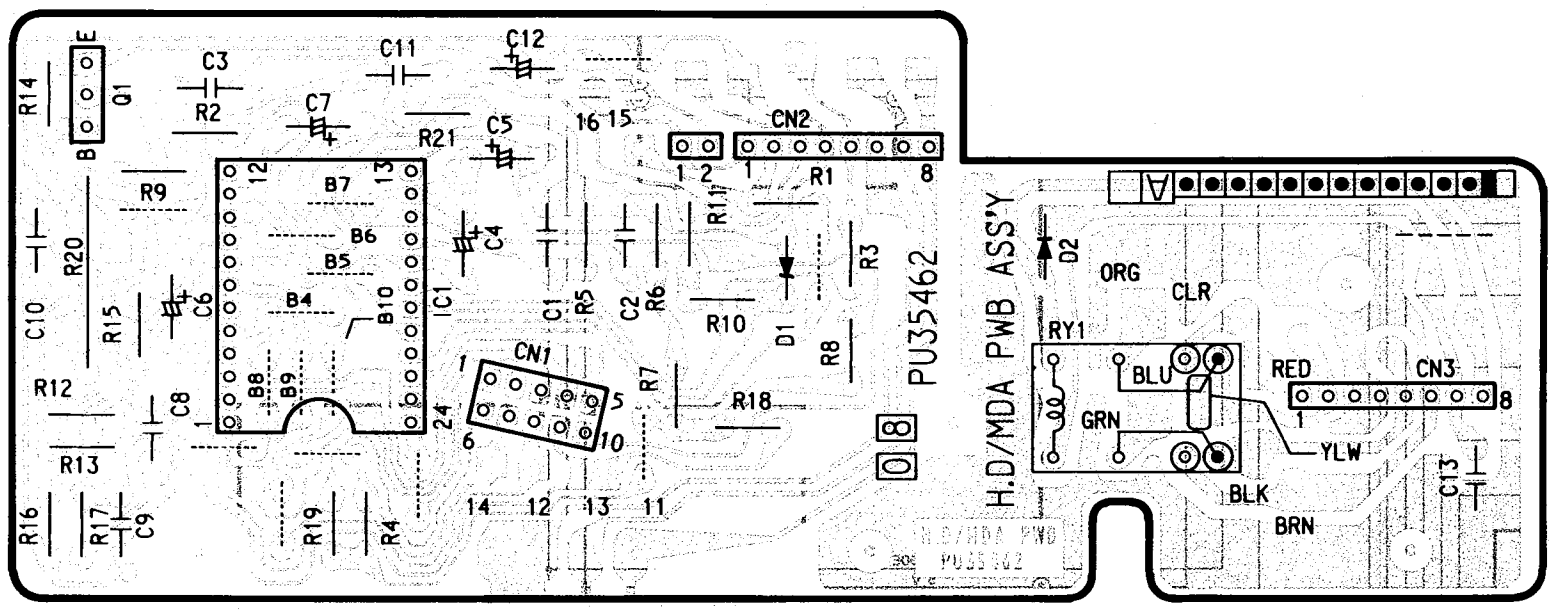


NOTES: Unless otherwise specified.

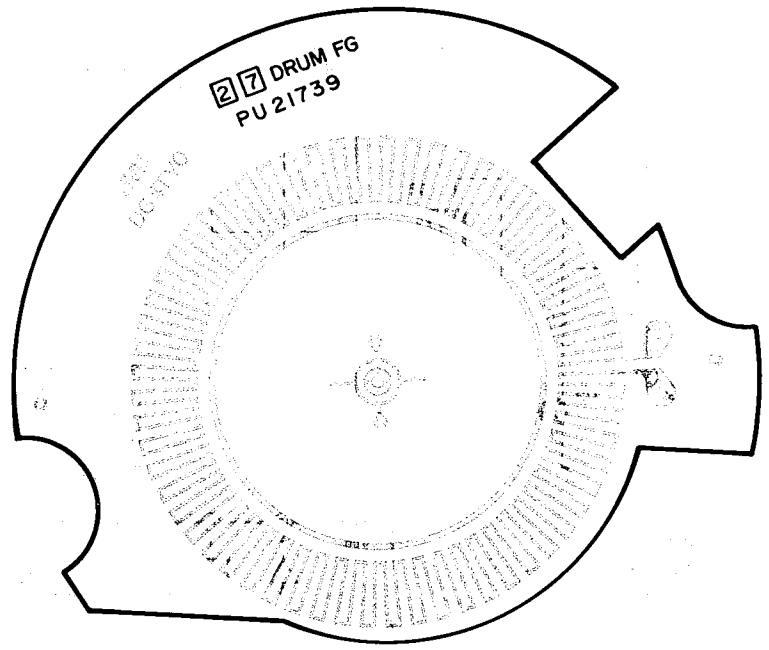
1. All resistance values are in ohms. (1/6 W)
2. All capacitance values are in μF.
3. Voltages are DC-measured with a digital voltmeter during recording (SP mode).
4. Shaded ( ) parts are critical for safety. Replace only with specified part numbers.

4.33 DRUM MDA, DRUM FG AND DRUM MOTOR CIRCUIT BOARDS

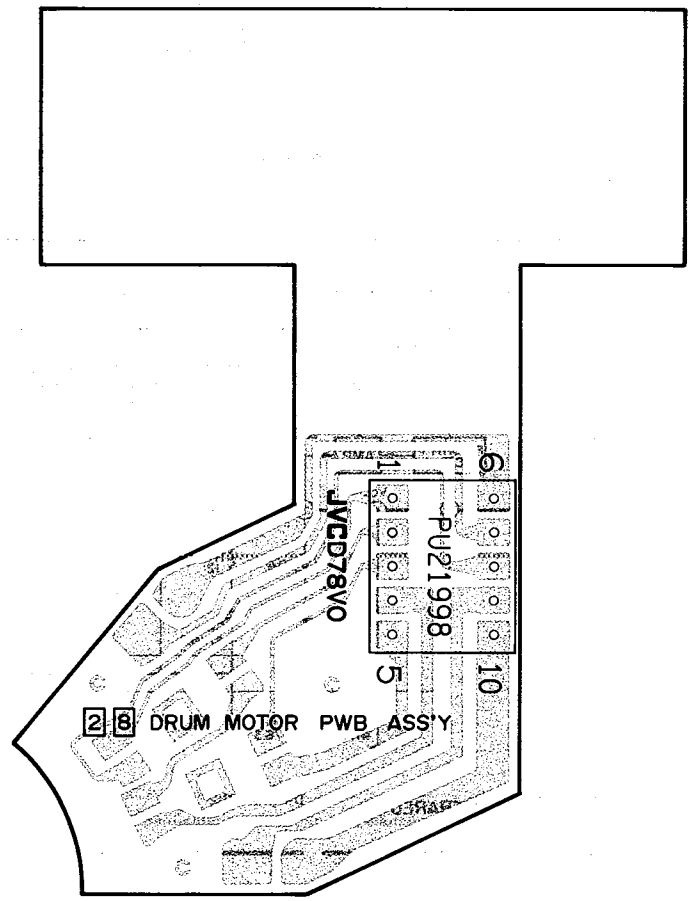
– DRUM MDA –



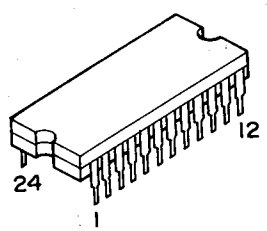
– DRUM FG –



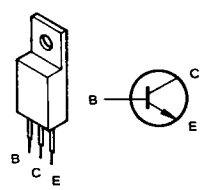
– DRUM MOTOR –



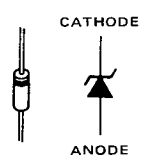
AN6671



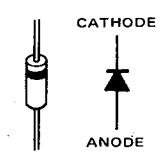
2SB941
2SB1052



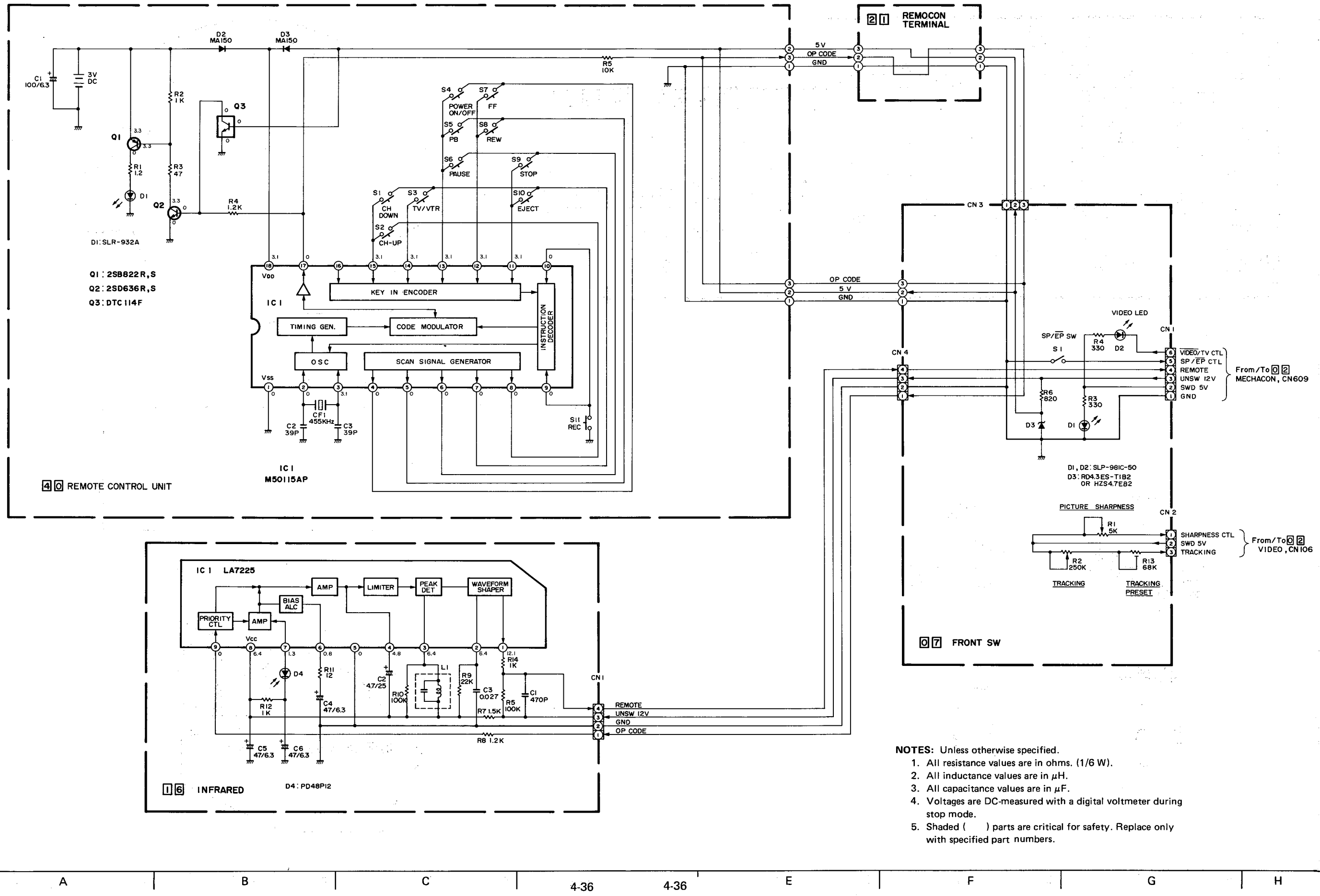
HZS5.1EB
RD5.1ES-T1B



MA162



4.34 REMOCON, FRONT SWITCH AND INFRARED SCHEMATIC DIAGRAMS

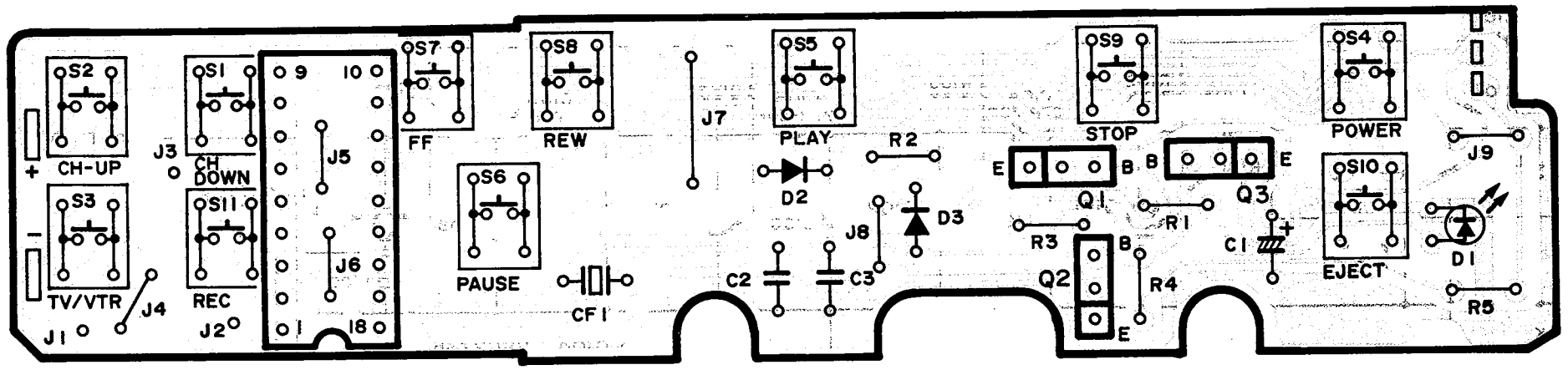


NOTES: Unless otherwise specified.

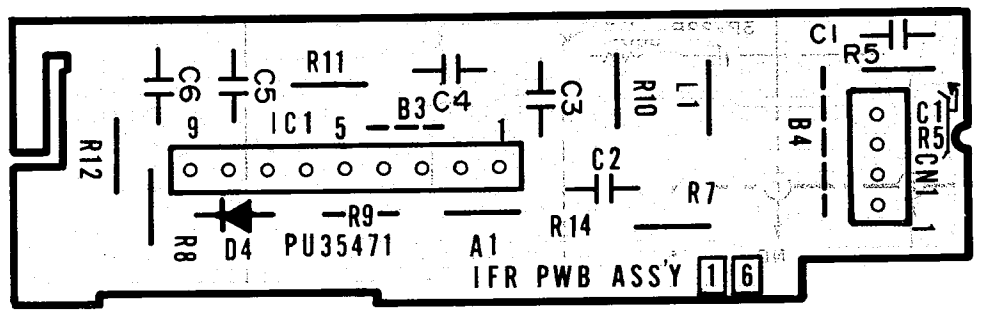
1. All resistance values are in ohms. (1/6 W).
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. Voltages are DC-measured with a digital voltmeter during stop mode.
5. Shaded ( ) parts are critical for safety. Replace only with specified part numbers.

4.35 REMOCON, FRONT SWITCH AND INFRARED CIRCUIT BOARDS

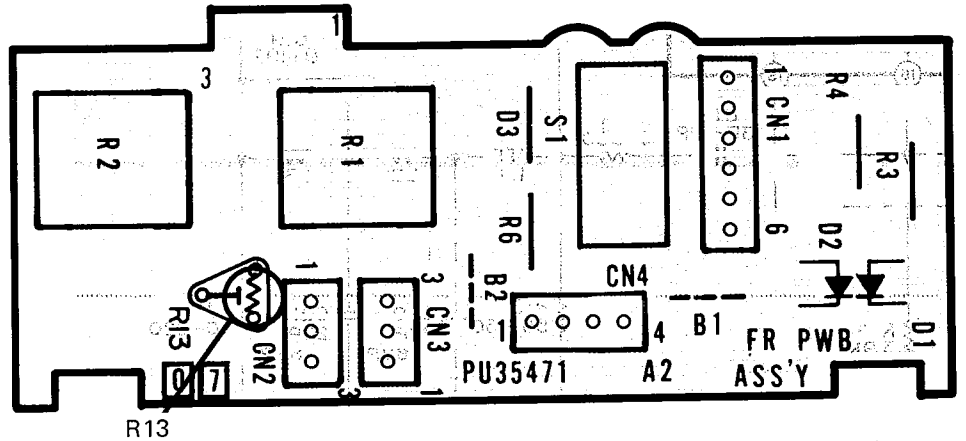
– REMOCON –



– INFRARED –

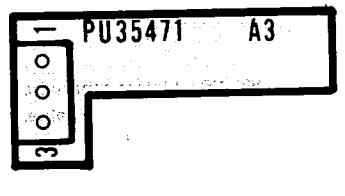


– FRONT SWITCH –



R13
TRACKING
PRESET

– REMOCON TERMINAL –

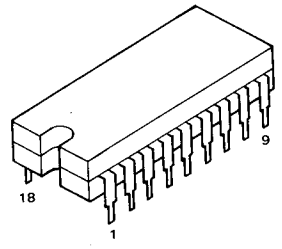


– MODE SHIFT TABLE –

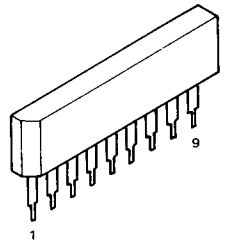
MODE / KEY	STOP	PLAY	STILL	FF	REW	REC	REC ↓ PAUSE	INSTANT REC	TIMER REC
STOP		○	○	○	○	○	○	○	×
PLAY	○		○	○	○		○ (REC PLAY)	×	×
PAUSE STILL	×	○	○ (F.ADV)	×	×	○ (REC PAUSE)		×	×
FF	○	○ (S.FF)	○ (S.FF)		○	×	×	×	×
REW	○	○ (S.REW)	○ (S.REW)	○		×	×	×	×
REC ↓ PLAY	○	○	○	○	○		○	×	×
REC ↓ PAUSE	○	○	○	○	○	○		×	×
EJECT	○	○	○	○	○	×	×	×	×
INSTANT REC	○	○	○	○	○	○	○	○ (※1)	○
CH. UP DOWN	○	×	×	○	○	×	○	×	×

○ : Enabled (mode changes)
× : Inhibited (mode does not change)
※1 : Recording time changes.

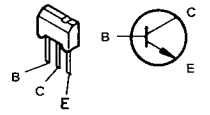
M50115AP



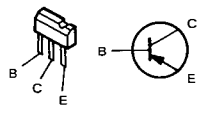
LA7225



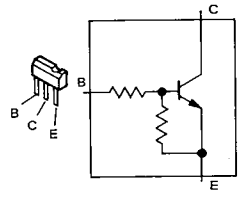
2SD636



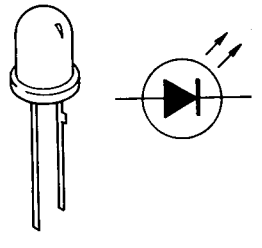
2SB822



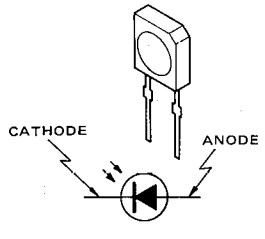
DTC114F



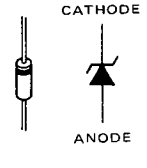
SLP-981C-50
SLR-932A



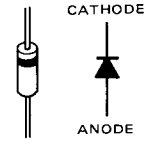
PD48PI2



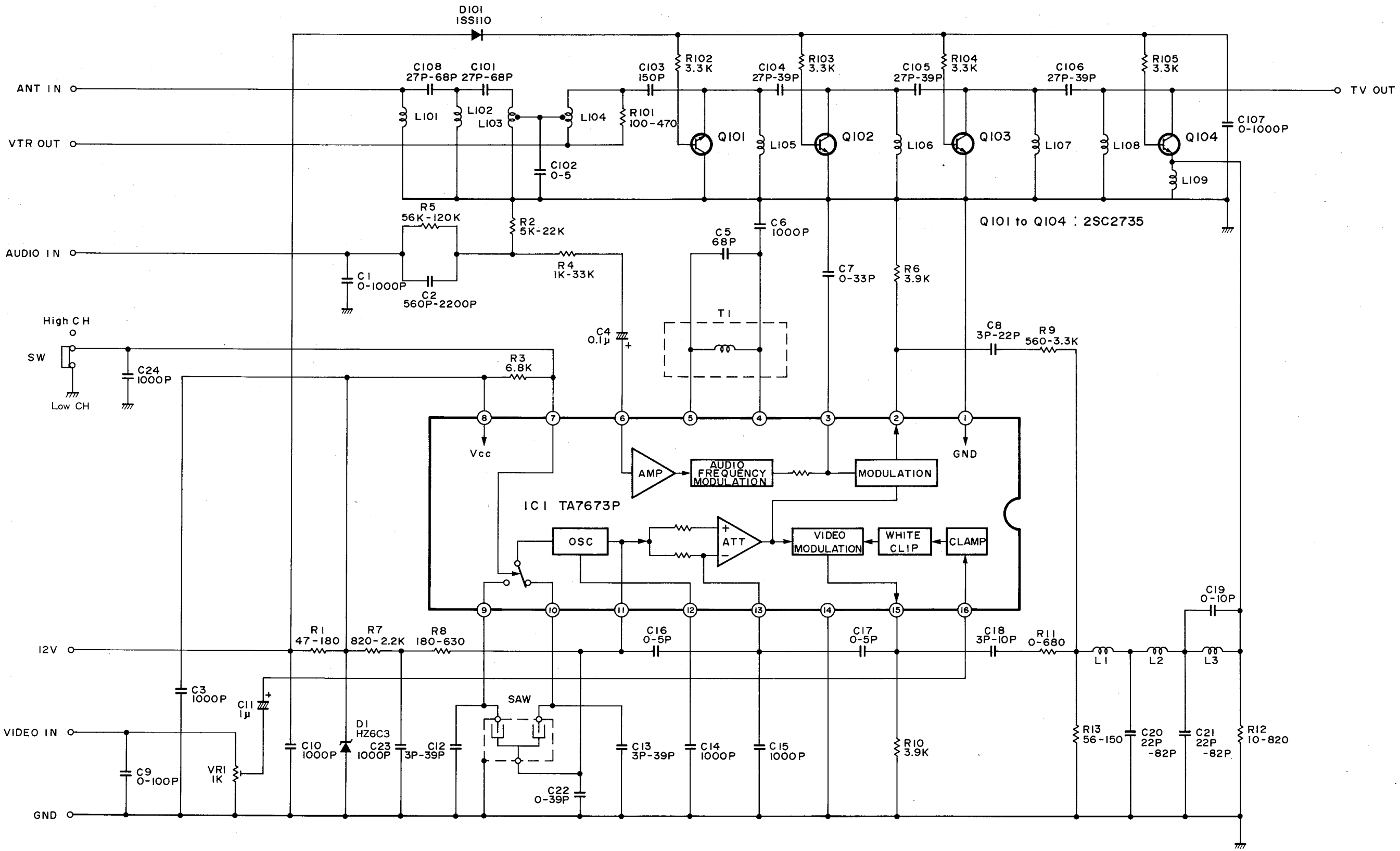
RD4.3ES-T1B2



MA150



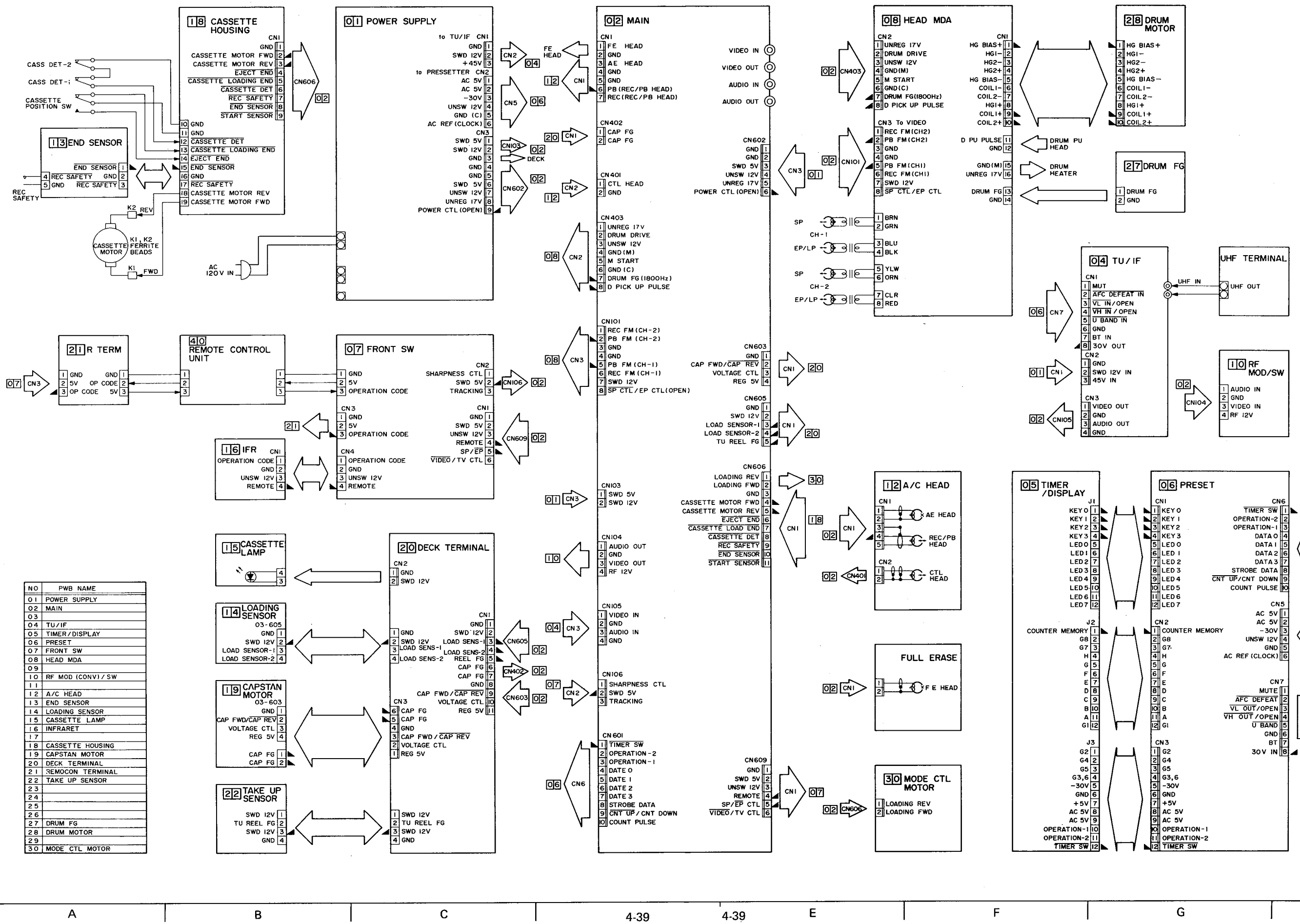
4.36 RF SWITCH AND RF MODULATOR SCHEMATIC DIAGRAM



NOTES: Unless otherwise specified.

1. All resistance values are in ohms.
2. All capacitance values are in F.

4.37 OVERALL WIRING



NO	PWB NAME
01	POWER SUPPLY
02	MAIN
03	
04	TU/IF
05	TIMER/DISPLAY
06	PRESET
07	FRONT SW
08	HEAD MDA
09	
10	RF MOD (CONV) / SW
11	
12	A/C HEAD
13	END SENSOR
14	LOADING SENSOR
15	CASSETTE LAMP
16	INFRARET
17	
18	CASSETTE HOUSING
19	CAPSTAN MOTOR
20	DECK TERMINAL
21	REMOCON TERMINAL
22	TAKE UP SENSOR
23	
24	
25	
26	
27	DRUM FG
28	DRUM MOTOR
29	
30	MODE CTL MOTOR

4-40

SECTION 5
EXPLODED VIEWS AND PARTS LIST

SAFETY PRECAUTION

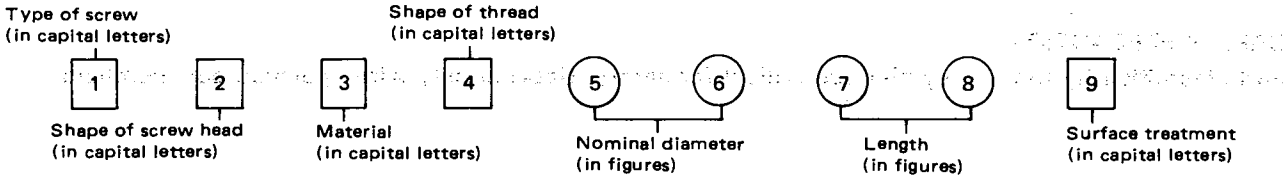
Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

	Page
5.1 STANDARD PART NUMBER CODING	5 - 2
5.1.1 Screw coding	5 - 2
5.2 EXPLODED VIEWS AND PARTS LIST	5 - 3
5.2.1 Packing assembly [M1]	5 - 3
5.2.2 Cabinet assembly [M2]	5 - 4
5.2.3 Chassis assembly [M3]	5 - 6
5.2.4 Mechanism assembly [M4]	5 - 8
5.2.5 Cassette housing assembly [M5]	5-10

5.1 STANDARD PART NUMBER CODING

5.1.1 Screw coding

Standard screw part numbers are as follows.

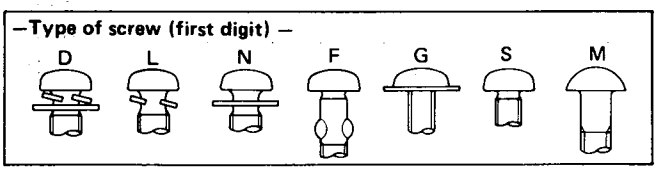


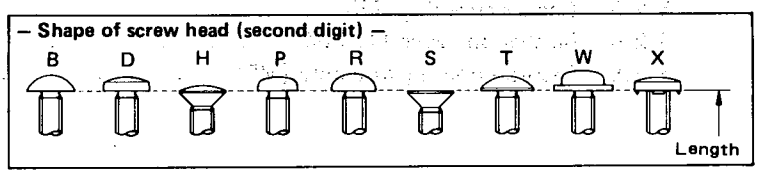
Type of screw (first digit)

- S Normal screws
- D Assembled machine screws (with plain and spring washers)
- L " (with spring washer)
- N " (with plain washer)
- F Feather screws
- G Washer head tapping screws
- M Wood screws

Shape of screw head (second digit)

- B Brazier head
- D Binding head
- H Oval countersunk head
- P Pan head
- R Round head
- S Flat head
- T Truss head
- W Washer head (machine screws)
- X Toothed head



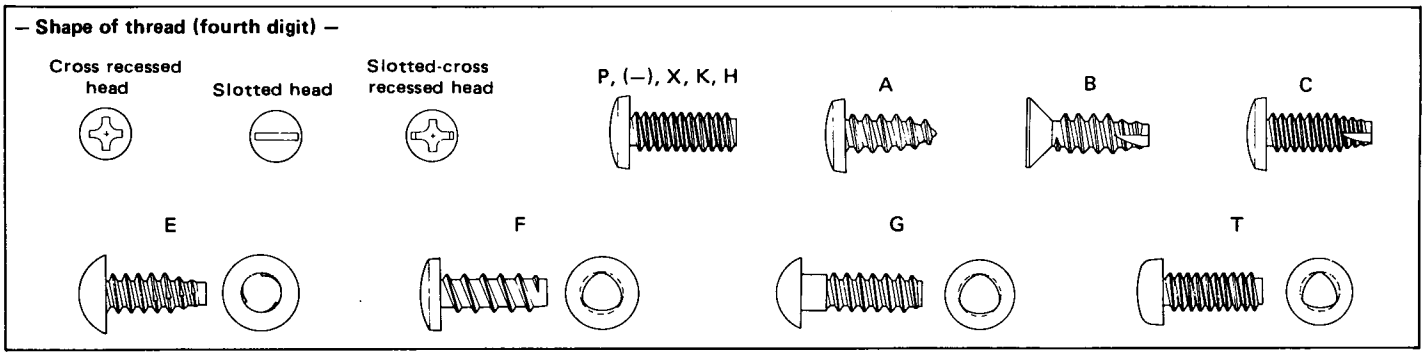


Material (third digit)

- S Steel
- E Stainless steel
- C Cast iron
- U Copper
- B Brass
- P Phosphor bronze
- N Nickel silver
- Y Cast brass
- A Aluminum
- Z Zinc alloy
- K Polycarbonate

Shape of thread (fourth digit)

- P Cross recessed head screws
- (–) Slotted head machine screws
- X Slotted-cross recessed head machine screws
- K Cross recessed head machine screws for precision equipment (type 1)
- H " (type 3)
- A Cross recessed head tapping screws (type 1)
- B " (type 2)
- C " (type 3)
- E Cross recessed head special tapping screws (brand : evertight)
- F " (brand : P-tight)
- T " (brand : taptight)
- G "



Nominal diameter (fifth and sixth digits)

The fifth and sixth digits are numbers indicating a nominal diameter or dimension. If the dimension exceeds 10 mm, three digits are used. The number indicates a nominal diameter or dimension, given in millimeters, multiplied by ten.

Length (seventh and eighth digits)

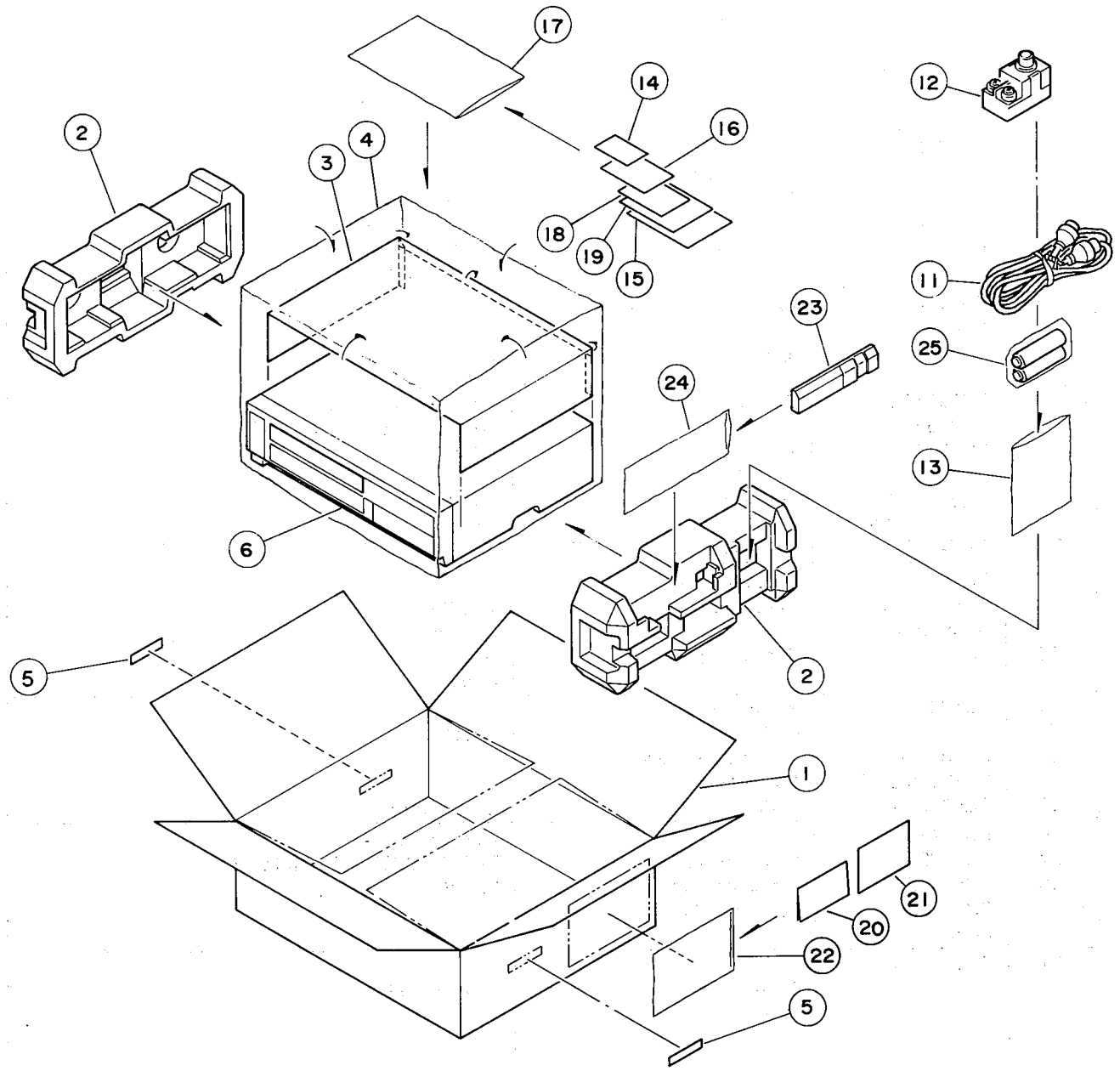
The seventh and eighth digits are numbers indicating length in milimeters. The preceding figure is zero when the dimension is smaller than 10 mm. For machine screws used in precision equipment whose length is given in units of 0.1 mm, the number indicates ten times the size of their length.

Surface treatment (ninth digit)

- Z Dichromate treatment after galvanizing (MFZn II-C)
- N Nickel plating (MFNi II, MFNi I)
- R Chromium plating (MBCr II, MBCr I)
- G Silver plating (SP4)
- B Black coating after plating
- F Blackening of iron (FB)
- M Blackening after galvanizing
- K Pickling of brass (PF2)
- P Phosphate treatment
- W Uni-chrome plating
- L Coating with transparent paint
- A Coloring red after galvanizing (MFZn II-C)
- C Coloring blue after galvanizing (MFZn II-C)
- T Coloring green after galvanizing (MFZn II-C)
- V Coloring purple after galvanizing (MFZn II-C)

5.2 EXPLODED VIEWS AND PARTS LIST

5.2.1 Packing assembly [M1]



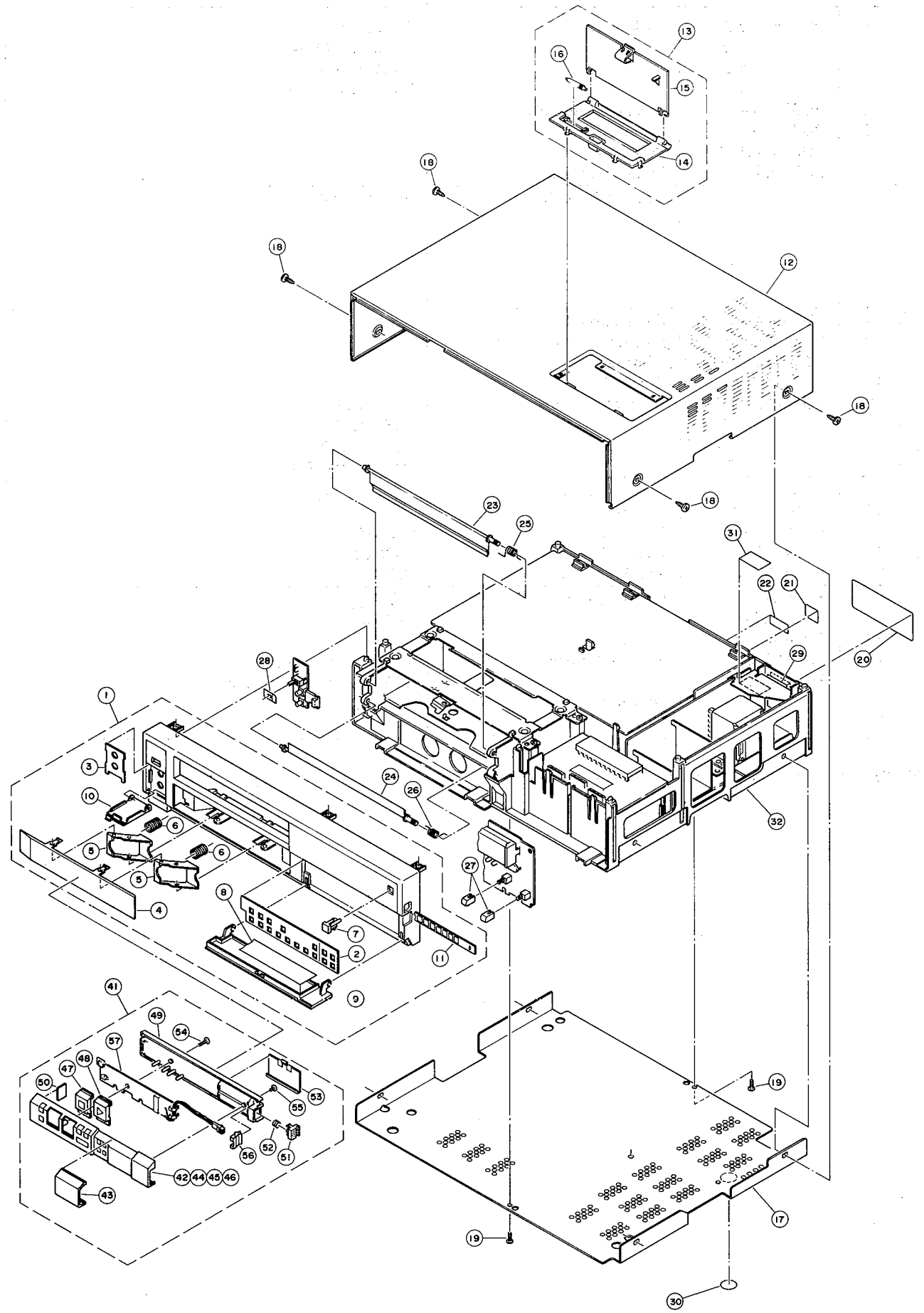
Packing and accessories [M1]

Symbol No.	Part No.	Part Name	Description	Q'ty
1	PQ30501-3-2	Packing Case	D150, U.S.A	1
	" -4-2	"	D150, CANADA	1
	" -6-2	"	D151, U.S.A	1
	" -7-2	"	D151, CANADA	1
2	PQ30706A	Cushion Assembly		1
3	PQ41026	Protect Sheet		1
4	PUM30021-33	Poly Bag		1
5	PUP40329	Serial No. Sticker		2
6	—	Cabinet Assembly	refer to [M2]	1
⚠ 11	PU54394-2	Cable Assembly		1
12	PU51305	Matching Transformer		1
13	QPGA023-02005	Poly Bag		1
14	PQ30576	Channel Film		1
⚠ 15	PU30425-711	Instruction Book	D150, U.S.A.	1
⚠	" -712	"	D150, CANADA	1
⚠	" -716	"	D151, U.S.A.	1
⚠	" -720	"	D151, CANADA	1
16	PU33941	Safety Caution		1
17	QPGA025-03505	Poly Bag		1
18	BT-20071A	Instruction Guide	CANADA	1
19	PU34278	Instruction Card	CANADA	1
20	BT-20046B	Toll Free Card	U.S.A.	1
21	BT-20062	Warranty Card	U.S.A.	1
	BT-20025H	"	CANADA	1
22	PU54821	Poly Bag		1
23	PU11132C-3	Remote Control Unit	D150, refer to [M2], Incl. 24	1
	PU11132E-3	"	D151, refer to [M2], Incl. 24	1
24	—	Poly Bag		1
25	PU57710-2	Battery		2

NOTE: [M] indicates mechanical symbol number.

5-3

5.2.2 Cabinet assembly [M2]



Cabinet assembly [M2]

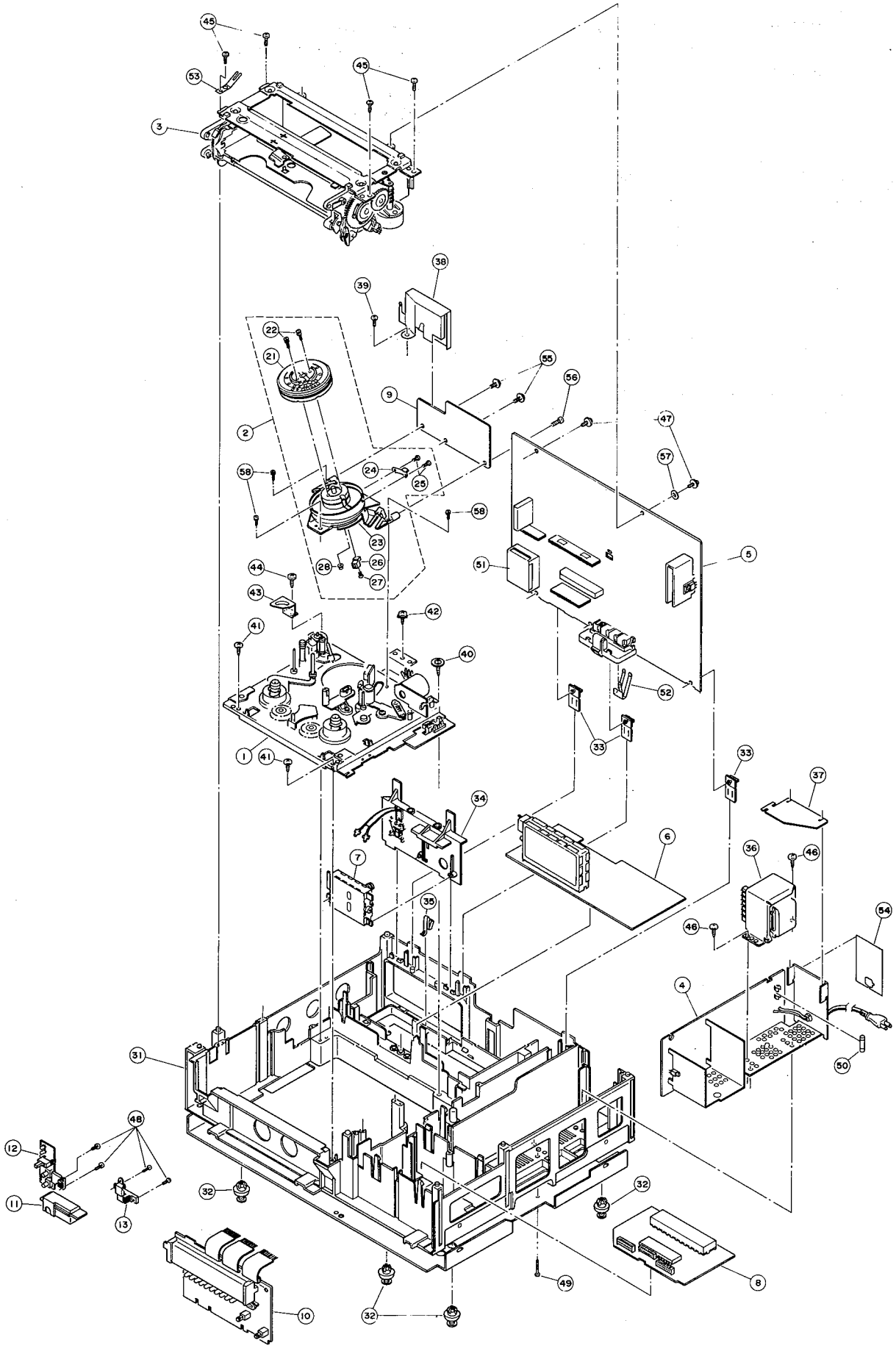
Symbol No.	Part No.	Part Name	Description	Q'ty
⚠ 1	PQ10124C-4	Front Panel Assembly	D150, Incl. 2 – 11	1
⚠	PQ10124E-4	"	D151, Incl. 2 – 11	1
2	PQ30457-2	Sheet (1)		1
3	PQ30458-2	Sheet (2)		1
4	PQ30440-3	Cover	D150	1
	" -5	"	D151	1
5	PQ30441-2	Link		2
6	PQM30002-175	Spring		2
7	PQ41294-2	Button	INSTANT REC	1
8	PQ30571-2	Program Label	Door (1)	1
9	PQ30564	Door (1)	D150, Timer/Program	1
	PQ30564-3	"	D151, Timer/Program	1
10	PQ30443-3	Door (2)	D150, Tracking/P. Sharpness	1
	" -5	"	D151, Tracking/P. Sharpness	1
11	PQ30460B	Channel Film Holder Ass'y	D150	1
	PQ30460C	"	D151	1
⚠ 12	PQ10125	Top Cover	D150	1
⚠	" -3	"	D151	1
⚠ 13	PQ30555C-3	Door Assembly	D150, Preset, Incl. 14 – 16	1
⚠	PQ30555E-3	"	D151, Preset, Incl. 14 – 16	1
14	PQ20143-1-4	Preset Cover	D150	1
	" -3-4	"	D151	1
15	PQ20131-3-5	Preset Door	D150	1
	" -5-5	"	D151	1
16	PQ41425	Preset Driver		1
⚠ 17	PQ10122-1-4	Bottom Cover		1
18	SDSA4014R	Tapping Screw	Top Cover	4
19	SESF3012Z	"	Bottom Cover	2
20	PU35541	Rating Label	D150	1
	" -3	"	D151	1
21	PU57296	Patent Label		1
⚠ 22	–	CSA Label	CANADA	1
23	PQ30107AF-19	Upper Door Assembly		1
24	PQ30030-8-15	Lower Door		1
25	PQ40104-2	Spring	Upper Door	1
26	PQ40472	"	Lower Door	1
27	PQ41291-1-2	Push Button	TIMER, COUNTER MEMORY	2
28	PQ41335	Indicator Sheet	EP/SP	1
⚠ 29	PU57772	Caution Label		1
⚠ 30	PU53146	"		1
⚠ 31	PU56767-1-1	"		1
32	–	Chassis Assembly	refer to [M3]	1
41	–	Remote Control Unit	refer to [M1], Incl. 42 – 57	1
42	PU35526-3-2	Upper Case	D150	1
	" -5-2	"	D151	1
43	PU35527	Slide Cover	D150	1
	" -3	"	D151	1
44	PU35528	Button (1)	D150, POWER, EJECT	1
	" -3	"	D151, POWER, EJECT	1
45	PU35529	Button (2)	D150, REW, FF, PAUSE/STILL	1
	" -3	"	D151, REW, FF, PAUSE/STILL	1

5-4

Symbol No.	Part No.	Part Name	Description	Q'ty
46	PU35530	Button (3)	D150, CHANNEL, REC, VIDEO/TV	1
	" -3	"	D151, CHANNEL, REC, VIDEO/TV	1
47	PU35531	Button (4)	D150, STOP	1
	" -4	"	D151, STOP	1
48	" -2	"	D150, PLAY	1
	" -5	"	D151, PLAY	1
49	PU35532-2	Lower Case		1
50	PU35533	IFR Window	Infrared	1
51	PU35534	Button	for Release	1
52	—	Spring		1
53	PU35535	Battery Cover		1
54	SSSF2010M	Tapping Screw		1
55	SSSF2006M	"		1
56	—	Battery Contact (W)		1
57	—	Remote Control Board Ass'y	refer to [40]	1

NOTES: [M] indicates mechanical symbol number.
[2 digits] indicates circuit board symbol number.

5.2.3 Chassis assembly [M3]



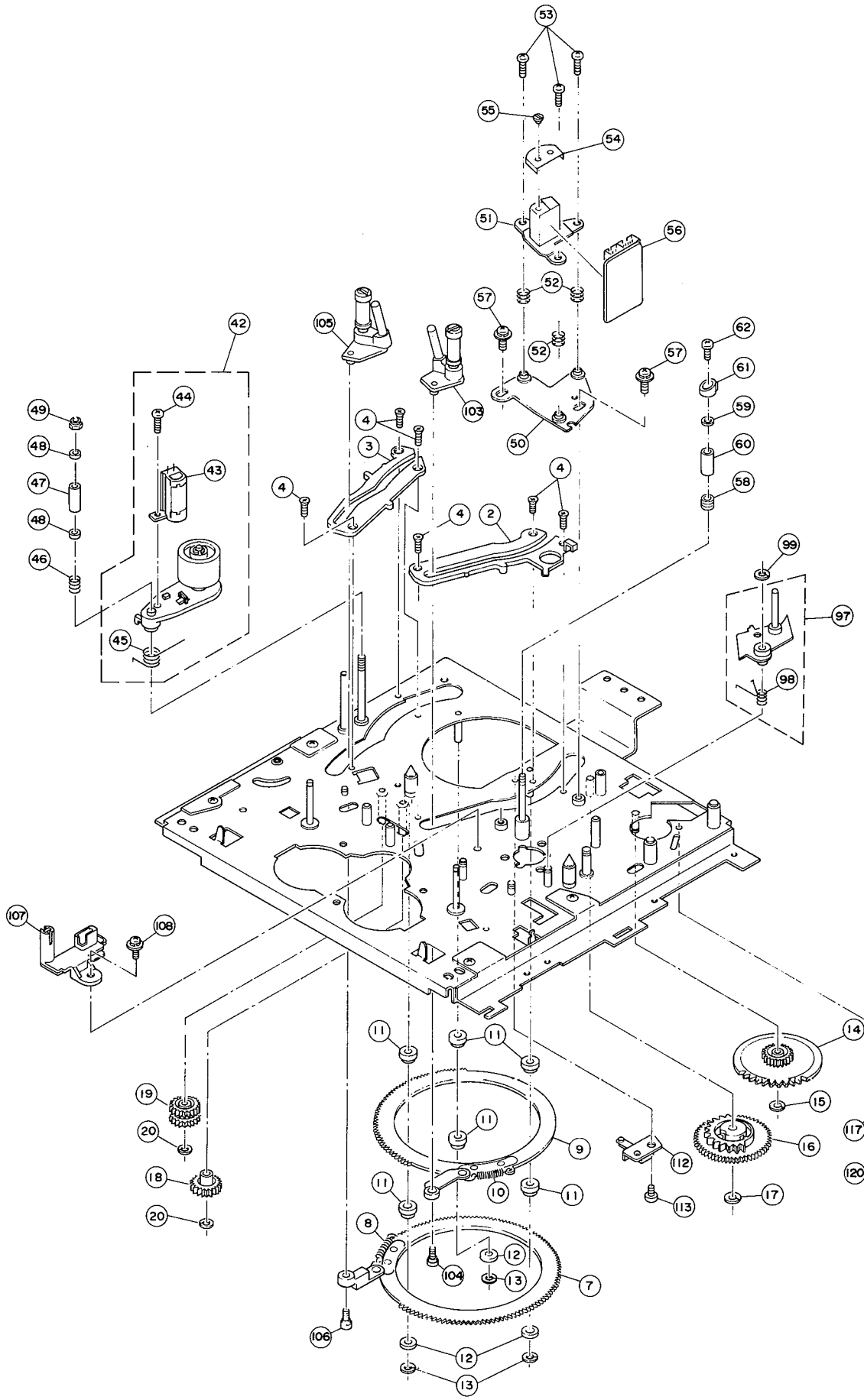
Chassis assembly [M3]

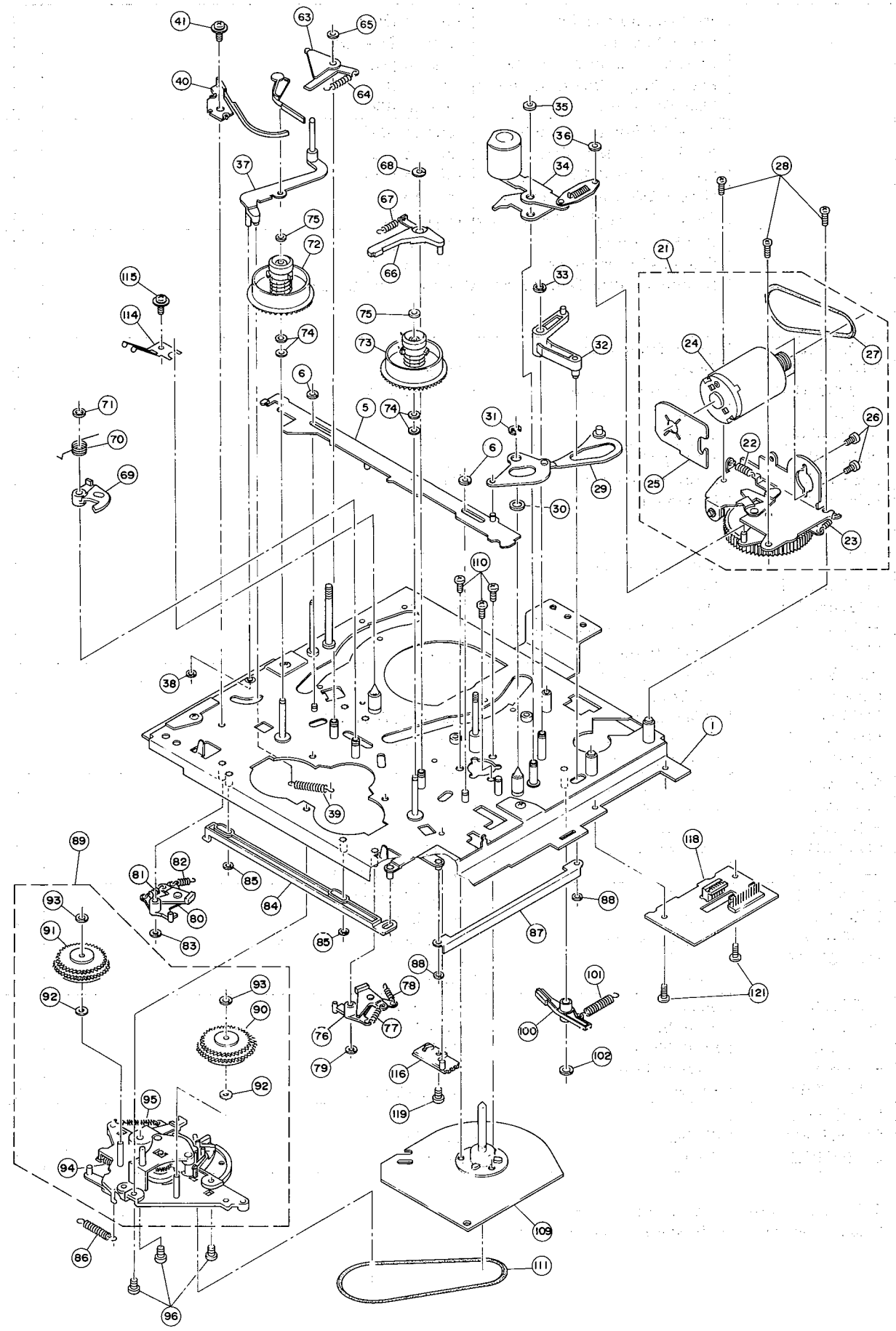
Symbol No.	Part No.	Part Name	Description	Q'ty
1	–	Mechanism Assembly	refer to [M4]	1
2	–	Drum Assembly	refer to 21 – 28	1
3	–	Cassette Housing Assembly	refer to [M5]	1
4	–	Power Supply Board Assembly	refer to [01]	1
5	–	Main Board Assembly	refer to [02]	1
6	–	Tuner/IF Board Assembly	refer to [04]	1
7	–	RF Switch & Modulator	refer to [10]	1
8	–	Presetter Board Assembly	refer to [06]	1
9	–	Head/MDA Board Assembly	refer to [08]	1
10	–	Timer/Display Board Assembly	refer to [05]	1
11	–	IFR Board Assembly	refer to [16]	1
12	–	Front SW Board Assembly	refer to [07]	1
13	–	Remote Control Terminal Board Ass'y	refer to [21]	1
21	PQ20014D-4	Upper Drum Assembly		1
22	NDBP2608N	Screw	Upper Drum	2
⚠ 23	PQ20024H-12	Drum Motor Assembly	Incl. 24 – 28	1
24	PU56202-5	Heater		1
25	SDBP2603N	Screw	Heater	2
26	PU57619	Pick-up Head		1
27	SPSH1735Z	Screw (precision)	Pick-up Head	1
28	PU49483-3	Commutator		1
31	–	Chassis Assembly		1
32	PU57662-1-1	Foot		4
33	PU57663-1-1	Hinge	Main Board	3
34	PU57664-2	Antenna Terminal Assembly		1
35	PQ41476	Earth Spring	GND	1
⚠ 36	PU57853	Power Transformer		1
⚠ 37	PQ30500-1-2	AC Cover		1
38	PU57677	Shield Case	Head/MDA Board	1
39	SPST3006Z	Tapping Screw	Shield Case	1
40	PQ40413	Special Screw	Main-deck	1
41	SDSA4012Z	Tapping Screw	"	2
42	PQ41396	Special Screw	"	1
43	PQ41585-1-1	Bracket		1
44	SDSA4012Z	Tapping Screw	Bracket	1
45	SDSF3012Z	"	Cassette Housing	4
46	SDSA4012Z	"	Power Transformer	2
47	DPSP300Z	Screw	Main Board	2
48	SBSF2008Z	Tapping Screw	F. SW & R. TER Boards	4
⚠ 49	SDST3020Z	"	GND	1
50	–	Fuse	refer to [01]	1
51	PU57669	Shield	Main Board (pre-amp)	1
52	PQ41561-1-2	Earth Spring	RCA GND	1
53	PQ41556	Earth Plate	GND	1
54	PQ30625	Bracket Sheet		1
55	DPSP2606Z	Screw	Head/MDA Board	2
56	LPSP2606Z	"	"	1
57	Q03093-502	Washer	Main Board	1
58	LPSP3008Z	Screw	Drum	3

NOTES: [M] indicates mechanical symbol number.
[2 digits] indicates circuit board symbol number.

5-7

5.2.4 Mechanism assembly [M4]





5-8

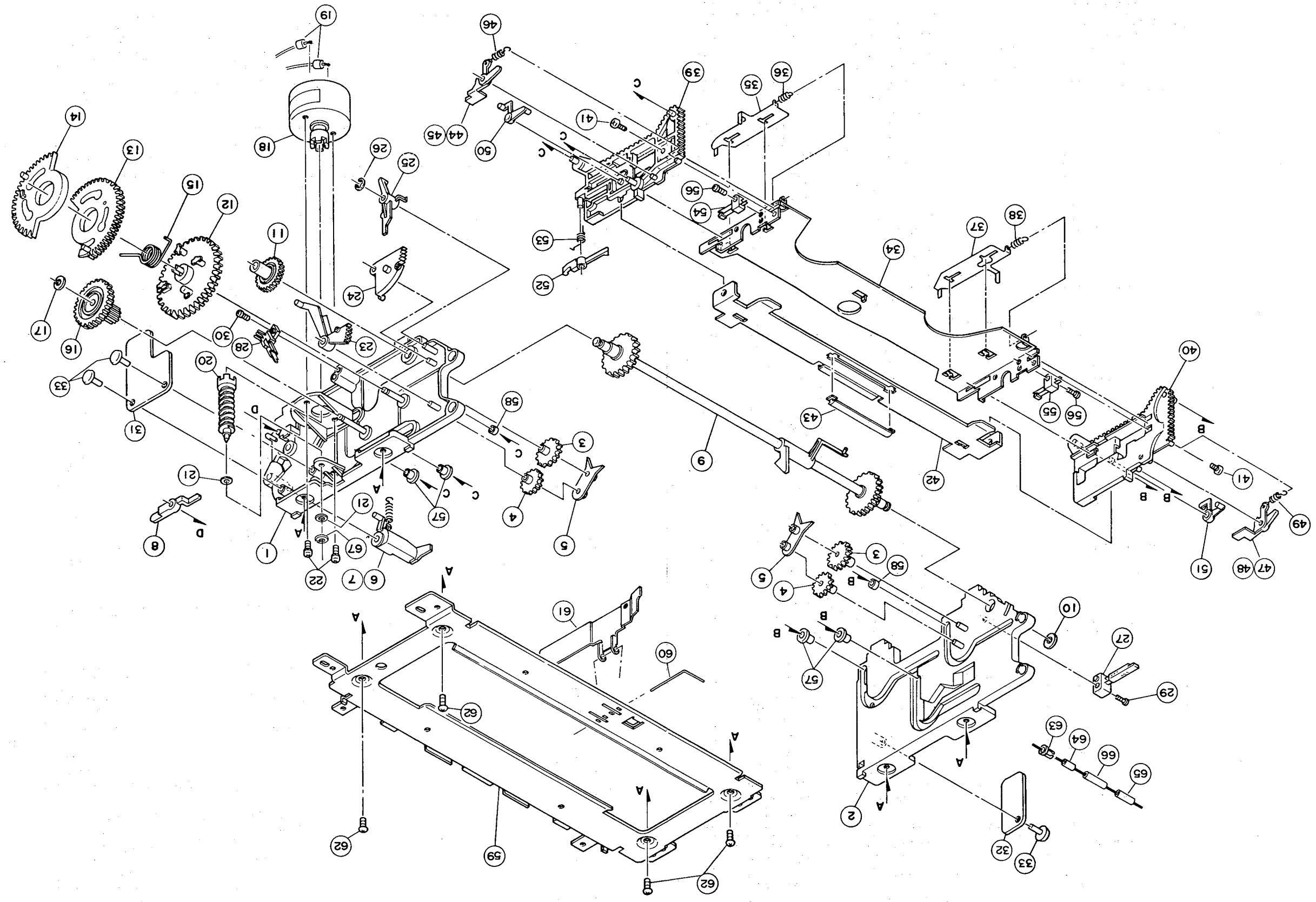
Mechanism assembly [M4]

Symbol No.	Part No.	Part Name	Description	Q'ty
1	—	Main deck Assembly		1
2	PQ30486	Loading Guide (T)		1
3	PQ30487	Loading Guide (S)		1
4	PQ41269	Special Screw	Loading Guides	6
5	PQ30130B-2	Slide Plate Assembly		1
6	PQM30017-8	Slit Washer	Slide Plate	2
7	PQ40223B	Loading Ring Assembly (S)	Incl. 8	1
8	PQM30001-151	Spring		1
9	PQ40227B	Loading Ring Assembly (T)	Incl. 10	1
10	PQM30001-151	Spring		1
11	PQ40213	Collar		6
12	PQM30005-29	"		3
13	PQM300017-4	Slit Washer	Loading Rings	3
14	PQ30489	Loading Gear (1)		1
15	PQM30017-12	Slit Washer	Loading Gear (1)	1
16	PQ41354A	Loading Gear (2) Assembly		1
17	PQM30017-12	Slit Washer	Loading Gear (2)	1
18	PQ40219	Connect Gear (1)		1
19	PQ40220	Connect Gear (2)		1
20	PQM30017-8	Slit Washer	Connect Gears	2
21	PUS36689H	Drive Gear Bracket Assembly	Incl. 22 – 27	1
22	PQM30001-129	Spring		1
23	" -130	"		1
⚠ 24	PQ40244A-2	Motor Assembly	Mode Control	1
25	—	Motor Board Assembly	refer to [30]	1
26	SPSP3003Z	Screw	Motor	2
27	PQM30003-14	Belt	Mode Control	1
28	SDSP2608Z	Screw	Drive Gear Bracket	3
29	PQ40246A	Lever Assembly		1
30	PQM30005-41	Collar		1
31	REE4000	E-Ring	Lever	1
32	PQ40250C	Cam Arm Assembly		1
33	PQM30017-12	Slit Washer	Cam Arm	1
34	PQ40252B-2	Pinch Roller Arm Assembly		1
35	PQM30017-12	Slit Washer	Pinch Roller Arm	1
36	" -8	"	"	1
37	PQ41364A	Tension Arm Assembly		1
38	PQM30017	Slit Washer	Tension Arm	1
39	PQM30001-184	Spring	Back Tension	1
40	PQ41370B	Tension Band Assembly		1
41	DPSP3006Z	Screw	Tension Band	1
42	PQ41374C	Full Erase Head Arm Assembly	Incl. 43 – 45	1
43	PU57641	Full Erase Head		1
44	SPSG2608Z	Tapping Screw	Full Erase Head	1
45	PQ40427	Spring		1
46	PQM30002-112	"		1
47	PU53629-2	Tape Guide	Supply Guide Pole	1
48	PQ40752	Guide Flange		2
49	PQ40353	Nylon Nut	Erase Head Arm	1
50	PQ41376A-1	Head Base Assembly	Audio/Control Head	1
51	PU57642	Audio/Control Head		1
52	PU30080-49	Spring		3
53	SPSP2608Z	Screw	Audio/Control Head	3
54	PQ41378	Shield Cap		1
55	HPSP1710N	Screw	Shield Cap	1
56	—	Audio/Control Head Board Ass'y	refer to [12]	1
57	DPSP2608Z	Screw	Head Base	2
58	PQ41348-2	Guide Flange (T)		1
59	PQ40268-2	Guide Flange		1
60	PU53629-2	Tape Guide	Take-up Guide Pole	1
61	PQ41346	Guide Pole Cap		1
62	SDSP2006Z	Screw	Tape Guide	1
63	PQ40274A-2	Loading Brake (S) Assembly	Incl. 64	1
64	PQM30001-175	Spring		1
65	PQM30017-12	Slit Washer	Loading Brake (S)	1
66	PQ40276A-2	Loading Brake (T) Assembly	Incl. 67	1
67	PQM30001-171	Spring		1
68	PQM30017-12	Slit Washer	Loading Brake (T)	1
69	PQ41379A	Gear Lever Assembly		1
70	PQ41162-1-2	Spring		1
71	PQM30017-13	Slit Washer	Gear Lever	1
72	PU57644-1-1	Reel Disk (S)		1
73	PU57645	" (T)		1
74	Q03093-828	Washer		4
75	PQM30017-5	Slit Washer	Reel Disks	2
76	PQ40285A	Main Brake (T) Assembly	Incl. 77 and 78	1
77	PQM30001-135	Spring		1
78	" -136	"		1
79	PQM30017-12	Slit Washer	Main Brake (T)	1
80	PQ40288A	Main Brake (S) Assembly	Incl. 81 – 82	1
81	PQM30001-135	Spring		1
82	" -136	"		1
83	PQM30017-12	Slit Washer	Main Brake (S)	1
84	PQ30133	Main Brake Slider		1
85	PQM30017-8	Slit Washer	Main Brake Slider	2
86	PQM30001-178	Spring		1
87	PQ40291	Push Plate		1
88	PQM30017-8	Slit Washer	Push Plate	2
89	PU57658A-1	Clutch Mechanism Assembly	Incl. 90 – 95	1
90	PU56043-1-2	Clutch (T)		1
91	PU56044-1-2	" (S)		1
92	Q03093-827	Washer		2
93	PQM30017-2	Slit Washer	Clutches	2
94	PQM30001-140	Spring		1
95	" -139	"		1
96	SPSP3006Z	Screw	Clutch Mechanism	6
97	PQ41384A	Guide Arm Assembly	Incl. 98	1
98	PQ41405	Spring		1
99	PQM30017-8	Slit Washer	Guide Arm	1
100	PQ41389A	Motor Brake Assembly	Incl. 101	1
101	PQM30001-182	Spring		1
102	PQM30017-12	Slit Washer	Motor Brake	1
103	PQ40354E-3	Pole Base (T) Assembly		1
104	PQ40295	Flange Screw	Pole Base (T)	1
105	PQ40357B-1	Pole Base (S) Assembly	or PQ40357A	1
106	PQ40295	Flange Screw	Pole Base (S)	1
107	—	LED Board Assembly	refer to [15]	1
108	DPSP3006Z	Screw	LED Board	1
⚠ 109	PU57647V	Capstan Motor		1
110	SDSP2603Z	Screw	Capstan Motor	3
111	PQM30003-10	Belt	Reel	1
112	PU56930-2	Brush Assembly		1
113	LPSP3004Z	Screw	Brush	1
114	PQ41282	Earth Plate		1
115	DPSP3005N	Screw		1
116	—	Reel Sensor (T) Board Ass'y	refer to [22]	1
117	—	Loading Sensor Board Ass'y	refer to [14]	1
118	—	Terminal Board Assembly	refer to [20]	1
119	SPST3008Z	Tapping Screw	Reel Sensor Board	1
120	DPSP3010Z	Screw	Loading Sensor Board	1
121	SDSP2608Z	"	Terminal Board	2

NOTES: [M] indicates mechanical symbol number.
[2 digits] indicates circuit board symbol number.

5-9

5-10



5.2.5 Cassette housing assembly [M5]

Cassette housing assembly [M5]

Ref. No.	Part No.	Part Name	Description	Q'ty
—	PUS26805K	Cassette Housing Assembly	Incl. 1—67	1
1	PQ30033D-4	Guide Stay (R) Assembly		1
2	PQ30276B-3	Guide Stay (L) Assembly		1
3	PQ40059	Gear (1)	left and right	2
4	PQ40060	Gear (2)	left and right	2
5	PQ40061	Double Cap		2
6	PQ40102A	Door Guide Assembly	Incl. 7, Guide Stay (R)	1
7	PUM30001-111	Spring		1
8	PQ40063	Guide Lever	Guide Stay (R)	1
9	PQ40103A	Connect Gear Assembly		1
10	PUM30017-11	Slit Washer	Connect Gear Assembly	1
11	PQ40065	Cam Gear (2)	Guide Stay (R)	1
12	PQ30028	Cam Gear (1)		1
13	PQ40066	Loading Slide Gear		1
14	PQ40067	UL Slide Gear	unloading	1
15	PQ40068-2	Limiter Spring	Cam Gear (1)	1
16	PQ40484	Worm Wheel		1
17	PUM30017-4	Slit Washer	Worm Assembly	1
⚠ 18	PQ40090A	Motor Assembly	cassette motor	1
19	PU45811	Ferrite Beads	Motor Assembly	2
20	PQ40091B	Worm Assembly		1
21	Q03093-838	Washer	Worm Assembly	2
22	SPSP2604Z	Screw	Motor Assembly	2
23	PQ40074	Upper Door Opener		1
24	PQ40075-1-5	Lower Door Opener		1
25	PQ40076-1-5	Hold Lever	Lower Door Opener	1
26	REE2500X	E-Ring	Hold Lever	1
27	PU51259-3	Leaf Switch	rec safety, Guide Stay (L)	1
28	PU55377-2 or PU55377-1-1	End Switch	cassette load end/eject end	1
29	SPSP2010Z	Screw	Leaf Switch	1
30	SBSE2610Z	Tapping Screw	End Switch	1
31	—	Cassette Housing Board	refer to [18]	1
32	—	End Sensor Board	refer to [13]	1
33	PU48973-3	Stopper	Cassette Housing/End Sensor Boards	3
34	PQ30031-1-3	Cassette Holder		1
35	PQ40106B-1	Slide Plate (R) Assembly	Incl. 36	1
36	PUM30001-113	Spring		1
37	PQ40107B-1	Slide Plate (L) Assembly	Incl. 38	1
38	PUM30001-113	Spring		1
39	PQ10009-1-4	Bracket (Right)		1
40	PQ10009-2-3	Bracket (Left)		1
41	SPSP2003Z	Screw	Bracket (Right/Left)	2
42	PQ30208	Reinforcement		1
43	PQ40479	Guard	Reinforcement	1
44	PQ40108B-3	Lock Lever (R) Assembly	Incl. 45,46	1
45	PQM30019-10	Pad	Lock Lever (R)	1
46	PUM30001-110	Spring		1
47	PQ40109B-3	Lock Lever (L) Assembly	Incl. 48,49	1
48	PQM30019-10	Pad		1
49	PUM30001-110	Spring		1
50	PQ40081A	Switch Lever (R) Assembly	Insert Switch (R)	1
51	PQ40081B	Switch Lever (L) Assembly	Insert Switch (L)	1
52	PQ40083-1-1	Lid Opener	Bracket (R)	1
53	PQ40084-1-2	Torsion Spring	Lid Opener	1
54	PU55378 or PU55378-1-1	Insert Switch (Right)	cassette in detector	1
55	PU55378-2 or PU55378-2-1	Insert Switch (Left)	cassette in detector	1
56	SPSP1704Z	Screw	Insert Switch (R/L)	2
57	PQ40086	Roller	Guide Stay (Right/Left)	4
58	PQ40087-2	Mini Roller	Guide Stay (Right/Left)	2
59	PQ20043	Roof Plate		1
60	PQ40440-1-1	Rod	Roof Plate	1
61	PQ40478-1-3	Upper Door Stopper		1
62	SBSE2608Z	Tapping Screw	Roof Plate	4
63	PQ40299	Wire Cap	Guide Stay (L)	1
64	QXT629H-020	UL Tube		1
65	QXT329H-035	UL Tube		1
66	QXTF253-040	UL Tube		1
67	PUM30017	Slit Washer	Worm Assembly	1

NOTES: [M] indicates mechanical symbol number.
[2 digits] indicates circuit board symbol number.

5-11

5-12

SECTION 6
ELECTRICAL PARTS LIST

SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

ABBREVIATIONS IN THIS LIST ARE AS FOLLOWS:

RESISTORS – All resistance values are in ohms (Ω).

K	:	1 000
M	:	1 000 000
CR	:	Carbon Resistor
Comp. R	:	Composition Resistor
WR	:	Wire Wound Resistor
OMR	:	Oxide Metal Film Resistor
VR	:	Variable Resistor (Potentiometer)
MFR	:	Metal Film Resistor
FR	:	Fusible Resistor
PMR	:	Precision Metal Film Resistor

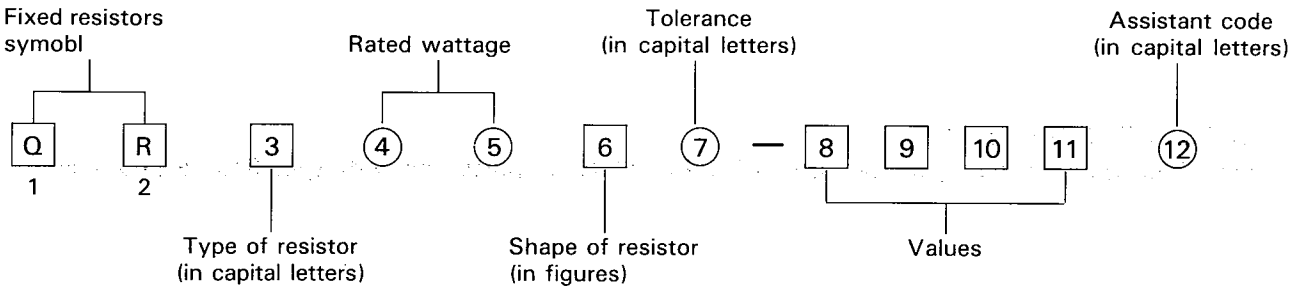
CAPACITORS – All capacitance values are in μF, unless otherwise indicated.

P	:	μμF
C Cap	:	Ceramic Capacitor
E Cap	:	Electrolytic Capacitor
FM Cap	:	Film Mica Capacitor
MM Cap	:	Metalized Mylar Capacitor
MP Cap	:	Metalized Paper Capacitor
MY Cap	:	Mylar Capacitor
NP Cap	:	Non-polar Capacitor
PC Cap	:	Polycarbonate Capacitor
PP Cap	:	Poly Pro Capacitor
PS Cap	:	Polystyrol Capacitor
T Cap	:	Tantalum Capacitor
TR Cap	:	Trimmer Capacitor
LL Cap	:	Low Leak Current Electrolytic Capacitor
TF Cap	:	Thin Film Capacitor

6.1 STANDARD PART NUMBER CODING

6.1.1 Fixed resistor coding

Fixed resistor part numbers are as follows.



Type of resistor (third digit)

C	Composition resistors
D	Carbon film resistors
F	Unflammable resistors
G	Oxide metal film resistors
H	Fusible resistors
M	Metal plate resistors
S	Metal glazed resistors
V	Precision metal film resistors
W	Wire wound resistors
X	Metal film resistors
Z	Special resistors

Rated wattage (fourth and fifth digits)

A0	1/10 W
18	1/8 W
16	1/6 W
14	1/4 W
12	1/2 W
01	1 W
02	2 W
03	3 W
04	4 W
05	5 W
06	6 W
07	7 W
75	7.5 W
08	8 W
10	10 W
15	15 W
A6	16 W
20	20 W
30	30 W

Tolerance (seventh digit)

F	± 1 %
G	± 2 %
J	± 5 %
K	± 10 %
M	± 20 %

Assistant code (twelfth digit)

A	Small type
B	Small type
S	Small type
Y	Lead taping
Z	Lead taping

Values (eighth — tenth or eleventh digits)

examples:

R47		0.47 Ω
4R7		4.7 Ω
470	47×10^{0}	47 Ω
471	47×10^{1}	470 Ω
472	47×10^{2}	4.7 kΩ
473	47×10^{3}	47 kΩ
474	47×10^{4}	470 kΩ
475	47×10^{5}	4.7 MΩ

QRV resistance shown by four digits:

4640	464×10^{0}	464 Ω
4641	464×10^{1}	4.64 kΩ
4642	464×10^{2}	46.4 kΩ

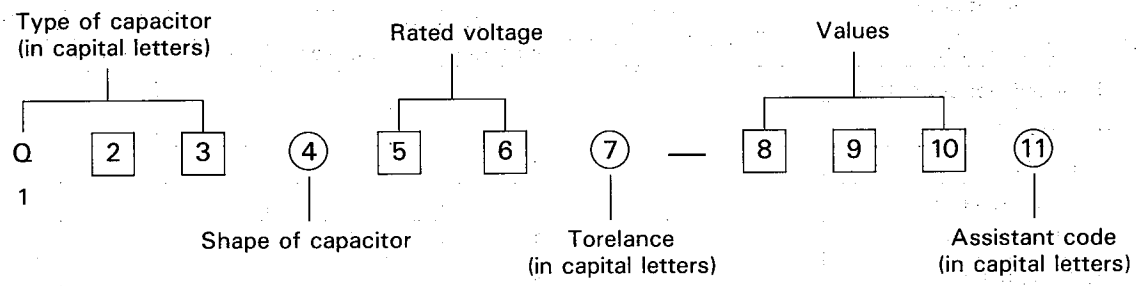
Shape of resistor (sixth digit)

Note: ■ marks are flame retardant resistor.

Shape of resistor \ Type of resistor	C	D	F	G	H	M	S	V	W	X
1										
2										
3										
4										
5									(L) type	
6										
7			Lug (B) type							
8			Lug (A) type				Chip			
9			Lug (C) type							

6.1.2 Fixed capacitor coding

Fixed capacitor part numbers are as follows.



Ceramic capacitors

Type of capacitor (first — third digits)		Shape of capacitor (fourth digit)				
Symbol	Characteristics	Mono-direction	Kink lead	Axial lead	Axial forming lead	Chip
QCC	Ceramic	1		4	5	
QCD	High capacitance					A
QCF	High capacitance	1,4	3			8,A
QCS	Temperature compensation	1	3	4	5	8,A
QCT	Temperature compensation	Special coding				8,A
QCV	Ceramic			1	3	
QCX	Ceramic			1	3	
QCY	High capacitance	1,4	3	6	7	8,A
QCZ	Special type	Special coding				

Electrolytic capacitors

Type of capacitor (first-third digits)		Shape of capacitor (fourth digit)				
Symbol	Characteristics	Tubular	Mono-direction	Anti-stress	Forming	Snap-in
QEB	Low leakage		4	5	6	
QEC	Low leakage		4,8,A	9,B	6,C	
QEE	Tantalum (normal)		4	5	6	
	Tantalum (small)		8			
QEF	Chip tantalum	8 (chip type)				
QEG	Low impedance		4			
QEK	Miniature type		4	5	6	
QEL	Small type		4	5	6	7
QEM	Small type		4	5	6	
QEN	Non-polar	2	4	5	6	
QEP	Non-polar (small)		4,A	5,B	6,C	
QER	Miniature type		4	5	6	
QET	Small type	2	4	5,B	6,C	7
QEU	Small type		4	5	6	
QEV	Small type		4		6	7
QEW	Normal	2	4	5	6	7

Paper film capacitors

Type of capacitor (first – third digits)		Shape of capacitor (fourth digit)				
		Tubular	Normal		Flame retardant	
Symbol	Characteristics		Mono-direction	Kink lead	Mono-direction	Kink lead
QFA	Metalized polypropylene				7	
QFE	Metalized mylar				5	
QFF	Film mica		4			
QFG	Polypropylene film		4	8		
QFH	Metalized mylar	2	4	3	5,7	6
QFJ	Mylar (special)		4			
QFK	Metalized mylar (small)				5	
QFM	Mylar	2	4	3,7	5	6
QFN	Mylar (small)		4	3		
QFP	Polypropylene		4	3,8		
QFS	Polystyrole	2	4	3		
QFV	Thin film		4	8		
QFZ	Special type	Special coding				

Rated voltage (fifth and sixth digits)

Fifth digit \ Sixth digit	A	B	C	D	E	F	G	H	J	K	V	W	X
0						3.15	4.0		6.3				
1	10		16	20	25		40	50	63	80	35		
2	100	125	160	200	250	315	400	500	630		350	450	600
3	1000	1250		2000				5000					

Tolerance (seventh digit)

A	$^{+100}_{-10}$ %	M	±20 %
F	±1 %	N	±30 %
G	±2 %	P	$^{+100}_{-0}$ %
H	$^{+50}_{-10}$ %	R	$^{+30}_{-10}$ %
J	±5 %	X	$^{+40}_{-20}$ %
K	±10 %	Z	$^{+80}_{-20}$ %

Values (eighth – tenth digits)

Example : Values are in picofarads

101	10×10^{1} pF	100 pF
102	10×10^{2} pF	1,000 pF (0.001 μF)
103	10×10^{3} pF	10,000 pF (0.01 μF)
104	10×10^{4} pF	100,000 pF (0.1 μF)
105	10×10^{5} pF	1 μF
5R0		5.0 pF

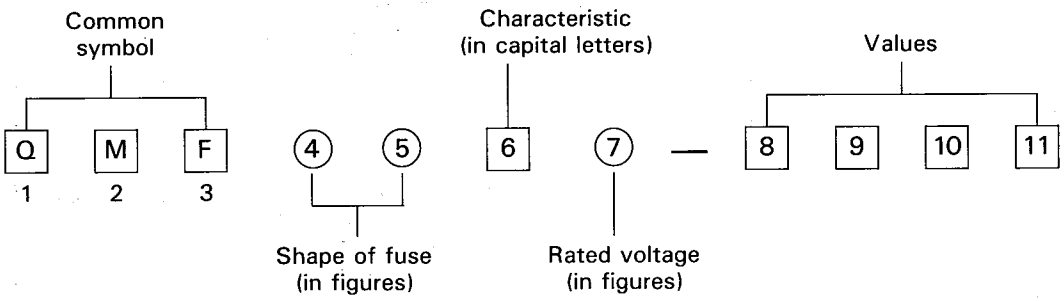
Assistant code (eleventh digit)

G Small size

Z Lead taping

6.1.3 Fuse coding

Standard fuse part numbers are as follows.



Shape of fuse
(fourth and fifth digits)

51	ϕ5.2×20 mm
60	ϕ6.4×30 mm
61	ϕ6.35×31.8 mm
63	ϕ6.4×30 mm with lead wires
66	ϕ6.35×31.8 mm with lead wires
00	Special type

Rated voltage
(seventh digit)

1	AC125 V
2	AC250 V
3	0.1—1 A : AC250 V 1.25—6.3 A : AC125 V

Values
(eighth-tenth or eleventh digits)
example:

R63	..... 0.63 A
1R0	..... 1.0 A
2R5	..... 2.5 A
100	..... 10 A
R315	..... 0.315 A
1R25	..... 1.25 A

Characteristics (sixth digit)

Symbol	Fusing Current	Fusing Time	Remarks
A	210 %	Within 2 min.	Anti-rush type (for Europe)
	275 %	0.6 — 10 sec.	
	400 %	0.15 — 3 sec.	
	1000 %	0.02 — 0.3 sec.	
B	210 %	Within 30 min.	Regular fusible type (for SEMKO, Europe)
	275 %	0.05 — 2 sec.	
	400 %	0.01 — 0.3 sec.	
C	135 %	Within 1 hr.	Regular fusible type (for UL, Japan)
	200 %	Within 2 min.	
E	210 %	Within 2 min.	Anti-rush type (for Europe)
	275 %	0.6 — 10 sec.	
	400 %	0.15 — 3 sec.	
	1000 %	0.02 — 0.3 sec.	
J	135 %	Within 1 hr.	Anti-rush type
	200 %	Within 2 min.	
M	135 %	Within 1 hr.	Regular fusible type (for UL)
	200 %	Within 2 min.	
R	160 %	Within 1 hr.	Regular fusible type
	200 %	Within 2 min.	
S	160 %	Within 1 hr.	Anti-rush type
	200 %	Within 2 min.	
	700 % — 2000 %	Within 0.01 sec.	
U	135 %	Within 1 hr.	Anti-rush type (for UL)
	200 %	Within 2 min.	
	800 % — 2000 %	Within 0.01 sec.	

6.2 ELECTRIC PARTS LIST BY ASSEMBLY

6.2.1 Power supply board ass'y [0][1] . . PU22022A-2

Symbol No.	Part No.	Part Name	Description
Q 1	–	–	
Q 2	2SD880O,Y,GR	Transistor	
⚠Q 3	2SD637Q,R,S	"	
Q 4	"	"	
Q 5	2SD880O,Y,GR	"	
⚠Q 6	2SD637Q,R,S	"	
Q 7	2SD880O,Y,GR	"	
⚠Q 8	2SD637Q,R,S	"	
⚠Q 9	"	"	
Q10	2SD638Q,R,S	"	
D 1	11E2	Diode	
D 2	"	"	
D 3	RD3.9EB	Zener Diode	
D 4	RD30EB3	"	
D 5	HZ4A2	"	
D 6	20E2	Diode	
D 7	"	"	
D 8	"	"	
D 9	"	"	
D10	10E2	"	
D11	"	"	
⚠D12	HZ12B3L	Zener Diode	
D13	11E2 or ERA12-01	Diode "	
D14	–	–	
D15	11E2 or ERA12-01	Diode "	
D16	11E2	"	
R 1	QRD181J-224	CR	
⚠R 2	QRG029J-152	OMR	
R 3	QRD181J-822	CR	
R 4	" -561	"	
R 5	" -331	"	
R 6	QVZ3517-221 or QVZ3518-221	VR "	5V ADJ
R 7	QRD181J-222	CR	
R 8	" -272	"	
R 9	" -682	"	
R10	" -562	"	
R11	" -562	"	
R12	" -123	"	
R13	" -473	"	
R14	" -331	"	
R15	" -221	"	
C 1	QETC1JM-476	E Cap	
⚠C 2	QETB1CM-228	"	
C 3	QETC1JM-476	"	
C 4	QET61HM-106	"	
C 5	QET61CM-336	"	

Symbol No.	Part No.	Part Name	Description
⚠C 6	QETB1VM-228	E Cap	
C 7	QCF31HP-103	C Cap	
C 8	QET61HM-106	E Cap	
C 9	QET60JM-476	"	
C10	QET61CM-107	"	
⚠C11	QETB1VM-108	"	
C12	QET61CM-336	"	
⚠CP 1	ICP-F25 or ICP-N25	Circuit Protector "	
⚠CP 2	ICP-F15 or ICP-N15	" "	
CN 1	PU49215-3	Cap. Housing	
CN 2	" -6	"	
CN 3	" -9	"	
TP	PU50766	Test Pin	
⚠	PU57505	Fuse Holder	
⚠	PU45375	Transistor Spacer	for Q2, 5, 7
⚠	PU41624-6	Isolat. Washer	"
⚠	SPSP3006ZY	Screw	"
⚠	QMP14B0-200	Power Cord	
⚠	A74316	Tab	AC IN
R101	QRC121K-225E	Comp. R	
⚠C101	QCZ9016-472P	C Cap	
⚠	QHS3771-108	Strain Relief	
⚠	PQ30464-1-1	Heat Sink	
⚠	PQ30455-2	Trans Bracket	
⚠	SDST3006Z	Screw	for Bracket

The following fuse is not included in PU22022A-2.

⚠F 1	QMF51U1-R63	Fuse	

6.2.2 A/V/S/M (Main) board ass'y [0][2] . PU11125B-1

Symbol No.	Part No.	Part Name	Description
	[AUDIO Section]		
IC 1	AN3991K	Integrated Circuit	
IC 2	TA7361P	"	
Q 1	DTC124F	D. Transistor	
Q 2	"	"	
Q 3	2SD636Q,R,S	Transistor	
Q 4	DTC124F	D. Transistor	
Q 5	2SB643Q,R,S	Transistor	
Q 6	2SD636Q,R,S	"	
D 1	MA165 or 1SS133	Diode "	
D 2	MA165 or 1SS133	" "	
D 3	MA165 or 1SS133	" "	
D 4	MA165 or 1SS133	" "	
D 5	MA165 or 1SS133	" "	
D 6	MA165 or 1SS133	" "	
R 1	–	–	
R 2	–	–	
R 3	QRD161J-393	CR	
R 4	" -271	"	
R 5	" -101	"	
R 6	" -224	"	
R 7	" -562	"	
R 8	" -271	"	
R 9	QVZ3518-222	VR	PB LEVEL
R10	QRD161J-562	CR	
R11	" -332	"	
R12	" -122	"	
R13	" -272	"	
R14	" -101	"	
R15	" -273	"	
R16	" -122	"	
R17	–	–	
R18	QRD161J-395	CR	
R19	" -103	"	
R20	–	–	
R21	QRD161J-103	CR	
R22	" -681	"	
R23	" -473	"	
R24	" -103	"	
R25	" -103	"	
R26	" -100	"	
R27	QVZ3518-104	VR	BIAS ADJ
R28	–	–	
R29	QRD161J-333	CR	
R30	" -220	"	
R31	" -332	"	
R32	" -103	"	
R33	" -222	"	

Symbol No.	Part No.	Part Name	Description
C 1	QET61AM-476	E Cap	
C 2	QCS31HJ-561	C Cap	
C 3	QET61HM-105	E Cap	
C 4	QET61CM-106	"	
C 5	QET61HM-334	"	
C 6	QFN31HJ-153	MY Cap	
C 7	QET61EM-475	E Cap	
C 8	" -475	"	
C 9	QFN31HJ-393	MY Cap	
C10	" -104	"	
C11	QET61HM-105	E Cap	
C12	QCS31HJ-561	C Cap	
C13	QET61CM-336	E Cap	
C14	QET61EM-475	"	
C15	QCY31HK-222	C Cap	
C16	QET61EM-475	E Cap	
C17	" -475	"	
C18	" -475	"	
C19	QET61AM-476	"	
C20	QET61EM-475	"	
C21	QFN31HJ-183	MY Cap	
C22	QCS31HJ-561	"	
C23	QFP32AJ-473	PP Cap	
C24	QET61CM-336	E Cap	
C25	QFN31HJ-102	MY Cap	
C26	" -332	"	
C27	QET61CM-336	E Cap	
L 1	PU48530-222J	Peaking Coil	
L 2	PU47051-682	Coil	
L 3	PU48530-561K	Peaking Coil	
CN 1	PU49215-7	Cap. Housing	
T 1	PU57566	Osc. Transformer	
TP	PU50766	Test Pin	

Symbol No.	Part No.	Part Name	Description
	[VIDEO Section]		
IC101	HA11782	Integrated Circuit	
IC102	PU11116A	RF Module Board Ass'y	
IC103	AN6392	Integrated Circuit	
IC104	PU11115A	Y Module Board Ass'y	
IC105	AN6328	Integrated Circuit	
Q101	2SC2021Q,R,S	Transistor	
Q102	2SC1740Q,R,S	"	
Q103	"	"	
Q104	2SC2021Q,R,S	"	
Q105	"	"	
Q106	DTC124F	D. Transistor	
Q107	2SB643R,S	Transistor	
Q108	2SA564Q,R	"	
Q109	2SC2021Q,R,S	"	
Q110	DTC124F	D. Transistor	
Q111	2SC2021Q,R,S	Transistor	
Q112	"	"	
Q113	2SB641R,S	"	
Q114	"	"	
Q115	2SB643R,S	"	
Q116	"	"	
Q117	2SC2021Q,R,S	"	
Q118	DTA124F	D. Transistor	
Q119	2SC2021R,S	Transistor	
Q120	2SB641R,S	"	
Q121	DTC124F	D. Transistor	
D101	OA90	Diode	
D102	RD2.7ES-T1B or HZS3.3EBTJ	Zener Diode "	
D103	1SS133 or MA165	Diode "	
D104	1SS133 or MA165	" "	
D105	1SS133 or MA165	" "	
D106	1SS133 or MA165	" "	
D107	1SS133 or MA165	" "	
R101	QRD161J-152	CR	
R102	" -152	"	
R103	" -100	"	
R104	" -223	"	
R105	" -333	"	
R106	" -152	"	
R107	" -100	"	
R108	" -223	"	
R109	" -122	"	
R110	" -272	"	
R111	" -102	"	
R112	" -102	"	
R113	" -222	"	
R114	" -271	"	
R115	" -223	"	
R116	—	—	
R117	QRD161J-102	CR	

Symbol No.	Part No.	Part Name	Description
R118	QRD161J-102	CR	
R119	" -122	"	
R120	" -102	"	
R121	" -222	"	
R122	" -821	"	
R123	" -271	"	
R124	" -330	"	
R125	" -223	"	
R126	" -272	"	
R127	" -331	"	
R128	" -623	"	
R129	" -820	"	
R130	" -561	"	
R131	" -121	"	
R132	" -222	"	
R133	" -102	"	
R134	" -102	"	
R135	" -331	"	
R136	" -102	"	
R137	" -102	"	
R138	" -102	"	
R139	" -821	"	
R140	" -221	"	
R141	" -223	"	
R142	" -122	"	
R143	" -223	"	
R144	" -391	"	
R145	QVZ3518-102	VR	REC FM
R146	QRD161J-331	CR	
R147	" -102	"	
R148	" -391	"	
R149	" -561	"	
R150	QVZ3518-222	VR	NC BAL
R151	QRD161J-562	CR	
R152	" -122	"	
R153	" -101	"	
R154	" -680	"	
R155	" -560	"	
R156	" -122	"	
R157	" -102	"	
R158	" -222	"	
R159	" -561	"	
R160	" -471	"	
R161	" -122	"	
R162	" -122	"	
R163	QVZ3518-472	VR	PB Y
R164	QRD161J-122	CR	
R165	" -331	"	
R166	" -102	"	
R167	" -391	"	
R168	" -391	"	
R169	" -471	"	
R170	" -562	"	
R171	" -272	"	
R172	" -393	"	
R173	" -392	"	
R174	" -393	"	
R175	" -561	"	
R176	" -393	"	
R177	" -222	"	
R178	" -822	"	
R179	" -123	"	
R180	" -272	"	
R181	" -153	"	
R182	" -822	"	

Symbol No.	Part No.	Part Name	Description
R183	QRD161J-272	CR	
R184	" -221	"	
R185	" -471	"	
R186	" -122	"	
R187	" -103	"	
R188	" -750	"	
R189	" -750	"	
C101	QCF31HP-223	C Cap	
C102	QET61HM-105	E Cap	
C103	—	—	
C104	—	—	
C105	QCF31HP-103	C Cap	
C106	" -103	"	
C107	—	—	
C108	QCF31HP-103	C Cap	
C109	" -103	"	
C110	" -103	"	
C111	" -103	"	
C112	" -103	"	
C113	QET61AM-476	E Cap	
C114	" -476	"	
C115	QCS31HJ-121	C Cap	
C116	QCF31HP-103	"	
C117	QCS31HJ-100	"	
C118	" -270	"	
C119	" -220	"	
C120	QET61HM-104	E Cap	
C121	QCF31HP-103Z	C Cap	
C122	QET61CM-106	E Cap	
C123	QCF31HP-223	C Cap	
C124	QET61CM-106	E Cap	
C125	QCF31HP-103	C Cap	
C126	QET61HM-105	E Cap	
C127	QCF31HP-223	C Cap	
C128	QCS31HJ-330	"	
C129	QCF31HP-103	"	
C130	QET61EM-475	E Cap	
C131	QET61HM-105	"	
C132	" -104	"	
C133	QET61EM-475	"	
C134	QCS31HJ-270	C Cap	
C135	" -121	"	
C136	QET61HM-105	E Cap	
C137	" -105	"	
C138	QET60JM-107	"	
C139	QCF31HP-223	C Cap	
C140	—	—	
C141	QCS31HJ-330	C Cap	
C142	" -100	"	
C143	QET61EM-475	E Cap	
C144	QCS31HJ-121	C Cap	
C145	" -121	"	
C146	QCF31HP-103	"	
C147	QET61CM-106	E Cap	
C148	QET60JM-107	"	
C149	QFN31HJ-333	MY Cap	
C150	QET61HM-225	E Cap	

Symbol No.	Part No.	Part Name	Description
C151	QET60JM-107	E Cap	
C152	QET61EM-475	"	
C153	QET61CM-336	"	
C154	—	—	
C155	QCS31HJ-330	C Cap	
C156	" -100	"	
C157	QFN31HJ-122	MY Cap	
C158	" -122	"	
C159	QET61HM-105	E Cap	
C160	QEN61HM-105	NP Cap	
C161	QET61HM-105	E Cap	
C162	QET61EM-475	"	
C163	QCT25CH-470	C Cap	
C164	QCF31HP-103	"	
C165	" -103	"	
C166	—	—	
C167	QCS31HJ-271	C Cap	
C168	" -221	"	
C169	" -150	"	
C170	QET60JM-107	E Cap	
C171	QCF31HP-103	C Cap	
C172	QET60JM-107	E Cap	
C173	QCS31HJ-820	C Cap	
C174	" -181	"	
C175	QET61CM-106	E Cap	
C176	QETC0JM-477	"	
C177	QET61CM-106	"	
C178	" -106	"	
C179	QET61HM-105	"	
C180	QCF11EZ-223	C Cap	
C181	" -223	"	
C182	" -223	"	
L101	PU48530-101K	Peaking Coil	
L102	" -101K	"	
L103	" -560J	"	
L104	" -820J	"	
L105	" -330J	"	
L106	" -390J	"	
L107	" -180K	"	
L108	" -180K	"	
L109	" -100J	"	
L110	" -8R2K	"	
L111	PU49994-101	"	
L112	PU48530-101K	"	
L113	" -121J	"	
L114	" -560J	"	
L115	" -271J	"	
L116	PU49994-101	"	
L117	—	—	
L118	PU48530-121J	Peaking Coil	
L119	—	—	
L120	PU48530-101K	Peaking Coil	
L121	" -121K	"	
LPF101	PU57397	Low Pass Filter	
EQ101	PU57396	FM Equalizer	
DL101	PU57401 or PU57401-2	1H Delay Line "	
	PU57668	Shield	
	PU57670	"	
TP	PU50766	Test Pin	

Symbol No.	Part No.	Part Name	Description
[COLOR Section]			
IC301	PU11117A-1	Color Module Board Ass'y	
Q301	2SC2021Q,R,S	Transistor	
Q302	"	"	
Q303	"	"	
Q304	"	"	
Q305	UN4212	D. Transistor	
Q306	DTC144N	"	
D301	1SS133 or MA165	Diode "	
D302	1SS133 or MA165	" "	
D303	1SS133 or MA165	" "	
R301	QRD161J-102	CR	
R302	" -102	"	
R303	" -221	"	
R304	" -272	"	
R305	" -152	"	
R306	" -473	"	
R307	" -102	"	
R308	" -102	"	
R309	" -222	"	
R310	" -331	"	
R311	" -272	"	
R312	" -271	"	
R313	" -223	"	
R314	" -223	"	
R315	QVZ3518-102	VR	SP REC COL
R316	" -102	"	EP REC COL
R317	QRD161J-102	CR	
R318	—	—	
R319	QRD161J-222	CR	
R320	—	—	
R321	QRD161J-122	CR	
R322	" -393	"	
R323	" -103	"	
R324	" -153	"	
R325	" -103	"	
R326	" -102	"	
R327	" -102	"	
R328	" -331	"	
R329	" -393	"	
R330	" -681	"	
R331	—	—	
R332	QRD162J-561	CR	
R333	QRD161J-393	"	
R334	" -122	"	
R335	" -221	"	
R336	" -222	"	
R337	" -222	"	
R338	" -471	"	

Symbol No.	Part No.	Part Name	Description
C301	QFN31HJ-473	MY Cap	
C302	QET61AM-476	E Cap	
C303	QCF31HP-103	C Cap	
C304	PU51163-201	"	200 P
C305	QET61CM-106	E Cap	
C306	QCF31HP-103	C Cap	
C307	" -103	"	
C308	" -103	"	
C309	" -103	"	
C310	QET61CM-106	E Cap	
C311	QET60JM-107	"	
C312	QFN31HJ-104	MY Cap	
C313	QET61EM-226	E Cap	
C314	QCT25CH-100	C Cap	
C315	PU57672-400	TR Cap	VXO (40 P)
C316	QET61HM-474	E Cap	
C317	QFN31HJ-473	MY Cap	
C318	QET61HM-224	E Cap	
C319	QET61AM-476	"	
C320	QFN31HJ-473	MY Cap	
C321	QET61EM-475	E Cap	
C322	QET61HM-225	"	
C323	QFN31HJ-332	MY Cap	
C324	—	—	
C325	QET61HM-225	E Cap	
C326	QCS31HJ-101	C Cap	
C327	—	—	
C328	QCS31HJ-330	C Cap	
C329	" -223	"	
C330	QET61HM-105	E Cap	
C331	QCS31HJ-271	C Cap	
C332	QEK41CM-106	E Cap	
C333	" -106	"	
L301	PU48530-222J	Peaking Coil	
L302	" -150K	"	
L303	PU49994-101	"	
X301	PU47931-2	Crystal	3.58 MHz
LPF301	PU53233-4	Low Pass Filter	
LPF302	PU54988	"	
EQ301	PU53501-5	Equalizer	
BPF301	PU52648-2	Band Pass Filter	
BPF302	PU57399	"	
DL301	PU57400	Comb Filter	
TP	PU50766	Test Pin	
TAB 1	A74017	Tab	
CN101	PU49215-8	Cap. Housing	
CN102	—	—	
CN103	PU49215-2	Cap. Housing	
CN104	" -4	"	
CN105	" -4R	"	
CN106	" -3	"	

Symbol No.	Part No.	Part Name	Description
	[SERVO Section]		
IC401	BA6305LN	Integrated Circuit	
IC402	HA11827NT	"	
IC403	UPD4066BC	"	
	or TC4066BP	"	
IC404	UPC324C	"	
	or IR3702	"	
IC405	M5223P	"	
IC406	IR9393	"	
Q401	DTA144WF	D. Transistor	
Q402	"	"	
Q403	2SB641R,S	Transistor	
Q404	2SD636R,S	"	
Q405	DTC144WF	D. Transistor	
Q406	2SD636R,S	Transistor	
D401	MA165	Diode	
	or 1SS133	"	
D402	MC931	Diode Array	
D403	"	"	
D404	MA165	Diode	
	or 1SS133	"	
D405	MA165	"	
	or 1SS133	"	
D406	MA165	"	
	or 1SS133	"	
D407	MC921	Diode Array	
D408	MC911	"	
D409	MA165	Diode	
	1SS133	"	
D410	MA165	"	
	or 1SS133	"	
D411	MA165	"	
	or 1SS133	"	
D412	MA165	"	
	or 1SS133	"	
R401	QRD161J-152	CR	
R402	" -684	"	
R403	" -103	"	
R404	" -331	"	
R405	" -472	"	
R406	" -103	"	
R407	" -331	"	
R408	" -331	"	
R409	" -103	"	
R410	–	–	
R411	QRD161J-103	CR	
R412	" -472	"	
R413	–	–	
R414	QRD161J-103	CR	
R415	–	–	
R416	QRD161J-683	CR	
R417	" -105	"	
R418	" -473	"	
R419	" -473	"	
R420	" -683	"	
R421	" -564	"	
R422	" -105	"	
R423	" -473	"	
R424	" -473	"	
R425	" -151	"	

Symbol No.	Part No.	Part Name	Description
R426	QRD161J-104	CR	
R427	QVZ3518-474	VR	PB SW CH-2
R428	QRD161J-104	CR	
R429	QVZ3518-474	VR	PB SW CH-1
R430	QRD161J-224	CR	
R431	QVZ3518-104	VR	EP PB SW
R432	QRD161J-103	CR	
R433	QVZ3521-474	VR	V. LOCK
R434	QRD161J-224	CR	
R435	" -274	"	
R436	" -393	"	
R437	QVZ3520-223	VR	DRUM DISCR.
R438	QRD161J-332	CR	
R439	" -332	"	
R440	" -471	"	
R441	–	–	
R442	QRD161J-103	CR	
R443	QVZ3518-224	VR	SP PRESET
R444	QRD161J-472	CR	
R445	–	–	
R446	QVZ3518-105	VR	LP PRESET
R447	QRD161J-103	CR	
R448	QVZ3518-105	VR	EP PRESET
R449	QRD161J-103	CR	
R450	" -472	"	
R451	–	–	
R452	QRD161J-223	CR	
R453	" -392	"	
R454	" -103	"	
R455	" -473	"	
R456	" -473	"	
R457	–	–	
R458	–	–	
R459	–	–	
R460	–	–	
R461	–	–	
R462	QRD161J-333	CR	
R463	" -105	"	
R464	" -105	"	
R465	" -104	"	
R466	" -223	"	
R467	" -103	"	
R468	" -104	"	
R469	" -104	"	
R470	" -564	"	
R471	" -223	"	
R472	" -472	"	
R473	" -472	"	
R474	–	–	
R475	QRD161J-472	CR	
R476	" -682	"	
R477	–	–	
R478	–	–	
R479	QRD161J-103	CR	
R480	" -821	"	
R481	–	–	
R482	QRD161J-564	CR	
R483	" -103	"	
R484	" -122	"	
R485	" -103	"	
R486	" -103	"	
R487	" -103	"	
R488	" -103	"	
R489	" -224	"	
R490	" -104	"	

Symbol No.	Part No.	Part Name	Description
R491	QRD161J-393	CR	
R492	" -103	"	
R493	" -102	"	
R494	" -101	"	
R495	" -105	"	
R496	—	—	
R497	—	—	
R498	QRD161J-103	CR	
R499	" -682	"	
R500	—	—	
R501	—	—	
C401	QCF31HP-102	C Cap	
C402	QET61CM-106	E Cap	
C403	—	—	
C404	QCY31HK-102	C Cap	
C405	QET61AM-476	E Cap	
C406	QET61CM-106	"	
C407	QFN31HK-103	MY Cap	
C408	—	—	
C409	QET61CM-106	E Cap	
C410	QEB61EM-475	LL Cap	
C411	QFN31HJ-473	MY Cap	
C412	" -473	"	
C413	QEB61CM-106	LL Cap	
C414	QFN31HJ-473	MY Cap	
C415	" -473	"	
C416	" -223	"	
C417	QET61CM-106	E Cap	
C418	QFN31HJ-682	MY Cap	
C419	" -682	"	
C420	" -223	"	
C421	" -122	"	
C422	" -122	"	
C423	" -102	"	
C424	QFN31HK-222	"	
C425	QFM71HJ-682	"	
C426	QET61HM-105	E Cap	
C427	QEN61CM-106	NP Cap	
C428	QFN31HK-473	MY Cap	
C429	" -563	"	
C430	QET61EM-226	E Cap	
C431	QFN31HJ-473	MY Cap	
C432	" -154	"	
C433	QET61CM-106	E Cap	
C434	QFN41HK-682	MY Cap	
C435	QFN31HK-182	"	
C436		—	
C437	—	—	
C438	QEN61HM-105	NP Cap	
C439	QEN61CM-106	"	
C440	QCS31HJ-470	C Cap	
C441	QFN31HK-103	MY Cap	
C442	QFN31HJ-333	"	
C443	QET61CM-106	E Cap	
C444	QFN31HJ-104	MY Cap	
C445	QCF31HP-102	C Cap	
C446	" -102	"	
C447	QCS31HJ-470	"	
C448	—	—	

Symbol No.	Part No.	Part Name	Description
C449	QCF31HP-102	C Cap	
C450	QET61HM-225	E Cap	
C451	QCF31HP-122	C Cap	
C452	QET61CM-106	E Cap	
C453	QCF31HP-102	C Cap	
C454	QFN31HK-683	MY Cap	
C455	QET61HM-105	E Cap	
C456	QEB61EM-475	LL Cap	
C457	QCF31HP-102	C Cap	
C458	QET61CM-106	E Cap	
C459	—	—	
C460	QET61CM-106	E Cap	
C461	QFN31HK-272	MY Cap	
CN401	PU49215-2R	Cap. Housing	
CN402	" -2	"	
CN403	" -8	"	
TP	PU50766	Test Pin	

Symbol No.	Part No.	Part Name	Description
	[MECHACON Section]		
IC601	M50730-601SP	Integrated Circuit	
IC602	LB1649	"	
Q601	–	–	
Q602	2SC3243D,E	Transistor	
Q603	2SD637R,S	"	
Q604	2SD880Y,GR	"	
Q605	DTA124F	D. Transistor	
Q606	"	"	
D601	MA165	Diode	
⚠D602	RD7.5ES-T1B2 or HZS7.5EB2	Zener Diode "	
D603	MA165	Diode	
D604	RD6.2ES-T1B1 or HZS6.2EB1	Zener Diode "	
D605	MA165	Diode	
D606	"	"	
D607	"	"	
D608	"	"	
D609	–	–	
D610	MA165	Diode	
D611	"	"	
D612	"	"	
D613	"	"	
D614	"	"	
D615	RD8.2ES-T1B2 or HZS8.2EB2	Zener Diode "	
D616	RD5.1ES-T1B2 or HZS5.1EB3	" "	
D617	MA165	Diode	
D618	"	"	
D619	"	"	
D620	"	"	
R601	QRD161J-332	CR	
R602	" -102	"	
R603	" -331	"	
R604	" -222	"	
R605	–	–	
R606	QRD161J-472	CR	
R607	" -472	"	
R608	–	–	
R609	QRD161J-472	CR	
R610	" -103	"	
R611	" -105	"	
R612	" -472	"	
R613	" -472	"	
R614	" -472	"	
R615	" -472	"	
R616	" -472	"	
R617	" -472	"	
R618	" -152	"	
R619	" -393	"	
R620	–	–	
R621	–	–	
R622	QRD161J-103	CR	
R623	QRD161J-103	CR	
R624	" -183	"	
R625	" -822	"	
R626	" -103	"	
R627	–	–	
R628	–	–	
R629	QRD161J-103	CR	
R630	" -103	"	
R631	" -103	"	
R632	" -332	"	
R633	" -332	"	
R634	" -103	"	
R635	" -103	"	
R636	" -103	"	
R637	" -103	"	
R638	" -124	"	
R639	" -124	"	
R640	" -472	"	
R641	" -472	"	
R642	–	–	
R643	QRD161J-273	CR	
R644	–	–	
R645	–	–	
R646	–	–	
R647	–	–	
R648	QRD161J-472	CR	
C601	QCS31HJ-471	C Cap	
C602	" -390	"	
C603	" -390	"	
C604	QET61EM-475	E Cap	
C605	QCF31HP-223	C Cap	
C606	" -223	"	
C607	QET61CM-336	E Cap	
C608	QCY41HK-102	C Cap	
C609	QCF31HP-223	C Cap	
C610	" -223	"	
C611	QET61CM-336	E Cap	
C612	" -106	"	
C613	–	–	
C614	QET61EM-106	E Cap	
C615	QET61CM-106	"	
⚠CP601	ICP-F20 or ICP-N20	Circuit Protector "	
CF601	PU56292	Ceramic Filter	
RA601	EXB-P84332M	Resistor Array	
RA602	EXB-P84472M	"	
CN601	PU49215-10	Cap. Housing	
CN602	" -6	"	
CN603	" -4	"	
CN604	–	–	
CN605	PU49215-5	Cap. Housing	
CN606	" -11	"	
CN607	–	–	
CN608	–	–	
CN609	PU49215-6	Cap. Housing	

Symbol No.	Part No.	Part Name	Description
⚠HS601	PU57894	Heat Sink	
	SPSP3006ZY	Screw	for Q604
	DPSP3008ZY	"	
	DPSP3006ZY	"	
	Q03093-501	Washer	
	PU57680-2-1	Jack Board	
	PU52105	Plastic Rivet	
	PU56729-2	Wire Clamp	

6.2.3 Tuner/IF board ass'y [0][4] PU21907B-1

Symbol No.	Part No.	Part Name	Description
IC 1	M51316BP	Integrated Circuit	
Q 1	2SC2636S,T	Transistor	
Q 2	2SA1254B	"	
	or 2SA1254C	"	
Q 3	2SD638R,S	"	
Q 4	—	—	
Q 5	—	—	
Q 6	2SD637R,S	Transistor	
Q 7	DTC144F	D. Transistor	
Q 8	—	—	
Q 9	2SB641Q,R,S	Transistor	
Q10	"	"	
Q11	"	"	
Q12	2SB644R,S	"	
Q13	2SD637R,S	"	
Q14	"	"	
D 1	RD6.8ES-T1B2	Zener Diode	
D 2	—	—	
D 3	—	—	
D 4	—	—	
D 5	—	—	
D 6	LTZ-R15	Diode	
D 7	HZT33-02	"	
	or HZT33	"	
D 8	1SS133	"	
	or MA165	"	
D 9	1SS133	"	
	or MA165	"	
D10	1SS133	"	
	or MA165	"	
D11	1SS133	"	
	or MA165	"	
R 1	—	—	
R 2	QRD161J-682	CR	
R 3	" -152	"	
R 4	—	—	
R 5	QRD161J-681	CR	
R 6	" -101	"	
R 7	" -220	"	
R 8	" -222	"	
R 9	—	—	
R10	QVZ3517-472	VR	RF AGC
	or QVZ3518-472	"	
R11	QRD161J-102	CR	
R12	" -103	"	
R13	" -334	"	
R14	" -222	"	
⚠R15	QRZ0054-100	FR	
R16	QRD161J-681	CR	
R17	" -331	"	
R18	" -102	"	
R19	" -821	"	
R20	—	—	
R21	QRD161J-563	CR	
R22	" -102	"	
R23	" -271	"	
R24	" -223	"	

Symbol No.	Part No.	Part Name	Description
R25	QRD161J-102	CR	
R26	" -103	"	
R27	" -223	"	
R28	" -561	"	
R29	" -681	"	
R30	–	–	
R31	–	–	
R32	QVZ3517-222 or QVZ3518-222	VR "	COL LEVEL
R33	QRD161J-680	CR	
R34	" -680	"	
R35	" -102	"	
R36	" -680	"	
R37	–	–	
R38	–	–	
R39	–	–	
R40	–	–	
R41	–	–	
R42	–	–	
R43	–	–	
R44	–	–	
R45	QRD161J-332	CR	
R46	–	–	
R47	–	–	
R48	–	–	
R49	–	–	
R50	QRD161J-104	CR	
R51	–	–	
R52	QRD161J-563	CR	
R53	" -563	"	
R54	" -472	"	
R55	" -103	"	
R56	" -103	"	
R57	–	–	
R58	QRD161J-103	CR	
R59	" -103	"	
R60	–	–	
R61	–	–	
R62	QRD161J-151	CR	
R63	" -473	"	
R64	" -102	"	
R65	" -334	"	
R66	" -472	"	
R67	" -331	"	
R68	–	–	
R69	–	–	
R70	–	–	
R71	QRD161J-472	CR	
R72	" -472	"	
R73	" -104	"	
R74	" -472	"	
R75	" -750	"	
R76	" -103	"	
R77	" -103	"	
R78	" -104	"	

Symbol No.	Part No.	Part Name	Description
C 1	–	–	
C 2	QCY31HK-102	C Cap	
C 3	" -102	"	
C 4	" -102	"	
C 5	QET61CM-106	E Cap	
C 6	QET61EM-475	"	
C 7	QFN31HK-473	MY Cap	
C 8	QCY31HK-222	C Cap	
C 9	QET61CM-106	E Cap	
C10	QFN31HK-473	MY Cap	
C11	QCY31HK-222	C Cap	
C12	" -222	"	
C13	" -222	"	
C14	" -222	"	
C15	QCF31HP-223	"	
C16	QET61CM-336	E Cap	
C17	QCS31HJ-560	C Cap	
C18	QCF31HP-223	"	
C19	QFN31HK-103	MY Cap	
C20	QET61HM-105	E Cap	
C21	–	–	
C22	–	–	
C23	QCY31HK-102	C Cap	
C24	QCT25LH-560	"	
C25	QCT25CH-100	"	
C26	QCY31HK-102	"	
C27	QET61CM-106	E Cap	
C28	QCY31HK-222	C Cap	
C29	QET61CM-336	E Cap	
C30	–	–	
C31	QCS31HJ-470	C Cap	
C32	–	–	
C33	QCF31HP-223	C Cap	
C34	–	–	
C35	–	–	
C36	–	–	
C37	–	–	
C38	–	–	
C39	–	–	
C40	–	–	
C41	–	–	
C42	–	–	
C43	–	–	
C44	QET61HM-474	E Cap	
C45	QET61CM-107	"	
C46	QFN31HJ-272	MY Cap	
C47	–	–	
C48	–	–	
C49	–	–	
C50	–	–	
C51	QCS31HJ-101	C Cap	
C52	QET61HM-106	E Cap	
C53	QCS31HJ-101	C Cap	
C54	QCF31HP-102	"	
C55	–	–	
C56	–	–	
C57	–	–	
C58	–	–	
C59	–	–	
C60	–	–	
C61	QET61CM-106	E Cap	
C62	" -106	"	
C63	QET61HM-335	"	
C64	QET61CM-106	"	
C65	QCY31HK-102	C Cap	

Symbol No.	Part No.	Part Name	Description
C66	QFN31HJ-104	MY Cap	
L 1	PU57717-R68	Peaking Coil	
L 2	PU48530-4R7K	"	
L 3	" -4R7K	"	
L 4	PU57717-1R5	"	
L 5	PU48530-100J	"	
L 6	" -180J	"	
L 7	" -270J	"	
SAW 1	PU35557	Saw Filter	
CF 1	PU57902	Ceramic Filter	
CF 2	PU54493	"	
CF 3	PU32990	"	
CF 4	PU32989-2	"	
T 1	—	—	
T 2	PU57759-2	IFT	AFC
T 3	PU55957-2	"	LLD
CN 1	PU49215-8	Cap. Housing	
CN 2	" -3	"	
CN 3	" -4	"	
TUR 1	PU34219-3	Tuner	

6.2.4 Timer/Display board ass'y [0][5]

. . . . . PU21974B-4 (HR-D150U/UC)
. . . . . PU21974C-4 (HR-D151U/UC)

Symbol No.	Part No.	Part Name	Description
IC101	MN1250BJA	Integrated Circuit	
Q 1	—	—	
Q 2	—	—	
Q 3	2SD637R	Transistor	
Q 4	"	"	
Q 5	"	"	
Q 6	"	"	
D 1	HZ7B	Zener Diode	
D 2	—	—	
D 3	—	—	
D 4	—	—	
D 5	MA161	Diode	HR-D150U/UC
D 6	"	"	HR-D151U/UC
D 7	—	—	
D 8	—	—	
D 9	—	—	
D10	MA161	Diode	
D11	"	"	
D12	"	"	
D13	"	"	
D14	"	"	
D15	TLG113A	LED	HR-D150U/UC
D16	"	"	
D17	"	"	
D18	"	"	
D19	"	"	
D20	"	"	
D21	"	"	
D22	"	"	
D23	"	"	
D24	"	"	
D25	"	"	
D26	"	"	
D27	"	"	
D28	"	"	HR-D150U/UC
R 1	—	—	
R 2	—	—	
R 3	QRD181J-471	CR	
R 4	" 471	"	
R36	QRD181J-272	CR	
R37	" -221	"	
R38	" -221	"	
R39	" -221	"	
R40	" -221	"	
R101	QRD181J-104	CR	
R102	" -153	"	
R103	" -272	"	

6.2.5 Presetter board ass'y [0][6]

. . . . . PU22010A-1 (HR-D150U/UC)
. . . . . PU22010B-1 (HR-D151U/UC)

Symbol No.	Part No.	Part Name	Description
R104	QRD181J-272	CR	
R105	—	—	
R106	QRD181J-102	CR	
C101	QET61HM-474	E Cap	
C102	QCS31HJ-470	C Cap	
C103	QCF31HP-223	C Cap	
SW 1	PU53598	Tact Switch	
SW 2	"	"	
SW 3	"	"	
SW 4	"	"	
SW 5	"	"	
SW 6	"	"	
SW 7	"	"	
SW 8	"	"	
SW 9	"	"	
SW10	"	"	
SW11	"	"	
SW12	"	"	
SW13	"	"	
SW14	"	"	
SW15	"	"	
SW16	"	"	
SW17	PU52621	Push Switch	
SW18	"	"	
FDP 1	PU57435-2	FDP	
	PU57752	Display Holder	

Symbol No.	Part No.	Part Name	Description
IC 1	HD614042SA96	Integrated Circuit	
IC 2	TL066CP	"	
⚠Q 1	2SD638R,S	Transistor	
Q 2	DTC144WF	D. Transistor	
Q201	—	—	
Q202	DTC114F	D. Transistor	HR-D150U/UC
Q203	"	"	
Q204	"	"	
Q205	"	"	
Q206	"	"	
Q207	"	"	
Q208	"	"	
Q209	"	"	
Q210	"	"	
Q211	"	"	
Q212	"	"	
Q213	"	"	
Q214	"	"	
Q215	"	"	HR-D150U/UC
D 1	1SS133	Diode	
D 2	LTZ-MR15	"	
D201	—	—	
D202	1SS133	Diode	HR-D150U/UC
D203	"	"	
D204	"	"	
D205	"	"	
D206	"	"	
D207	"	"	
D208	"	"	
D209	"	"	
D210	"	"	
D211	"	"	
D212	"	"	
D213	"	"	
D214	"	"	
D215	"	"	HR-D150U/UC
D216	1SS132	"	"
D217	"	"	
D218	"	"	
D219	"	"	
D220	"	"	
D221	"	"	
D222	"	"	
D223	"	"	
D224	"	"	
D225	"	"	
D226	"	"	
D227	"	"	
D228	"	"	
D229	"	"	HR-D150U/UC

Symbol No.	Part No.	Part Name	Description
R 1	QRD161J-471	CR	
R 2	" -561	"	
R 3	" -390	"	
R 4	" -100	"	
R 5	" -103	"	
R 6	" -473	"	
R 7	" -563	"	
R 8	" -474	"	
R 9	" -563	"	
R10	" -564	"	
R11	" -103	"	
R12	" -105	"	
R13	" -472	"	
R14	" -472	"	
R15	" -472	"	
R16	" -472	"	
R17	" -472	"	
R18	" -472	"	
R19	" -472	"	
R20	" -104	"	
R21	" -333	"	
R204	QRD161J-474	CR	
C 1	—	—	
C 2	QCF31HP-223	C Cap	
C 3	" -223	"	
C 4	" -103	"	
C 5	QFN31HJ-104	MY Cap	
C 6	—	—	
C 7	QCS31HJ-100	C Cap	
C 8	" -100	"	
C 9	QET61CM-336	E Cap	
C10	QET61EM-335	"	
C11	PU56103	Gold Cap	
C12	QEK61HM-474	E Cap	
C13	" -474	"	
C14	" -335	"	
C15	QCF31HP-103	C Cap	
C16	QEK61HM-474	E Cap	
RA 1	EXB-P84104M	Resistor Array	
RA 2	EXB-P86224M	"	
X 1	PU57606	Crystal	4.19 MHz
SW 1	PU57628	Slide Switch	
CN 1	PU49215-12	Cap. Housing	
CN 2	" -12	"	
CN 3	" -12	"	
CN 4	—	—	
CN 5	PU49215-6	Cap. Housing	
CN 6	" -10	"	
CN 7	" -8	"	
TP	PU45908	Test Pin	
TB 1	PU57634-2	Tuning Block	HR-D150U/UC
	" -3	"	HR-D151U/UC

6.2.6 Front switch board ass'y [0][7]

. . . . . PU35471C2-1 (HR-D150U/UC)
. . . . . PU35471D2-1 (HR-D151U/UC)

Symbol No.	Part No.	Part Name	Description
D 1	SLP-981C-50	LED	
D 2	"	"	
D 3	RD4.3ES-T1B2 or HZS4.7EB2	Zener Diode "	
R 1	PU57378-2	VR (5 K)	SHARPNESS
R 2	PU57379-3	VR (250 K)	TRACKING
R 3	QRD161J-331	CR	
R 4	" -331	"	
R 5	—	—	
R 6	QRD161J-821	CR	
R 7	—	—	
R 8	—	—	
R 9	—	—	
R10	—	—	
R11	—	—	
R12	—	—	
R13	QVZ3514-683	VR	PRESET
S 1	PU57724	Slide Switch	HR-D150U/UC
	" -2	"	HR-D151U/UC
	PU57678	Terminal Ass'y (1)	

6.2.17 Take-up sensor board ass'y [2][2] PU35474A2

Symbol No.	Part No.	Part Name	Description
	PQ41391	Holder	
Q 1	GP2L04B	Photo Sensor	

6.2.18 FG board ass'y [2][7] PU34473C

Symbol No.	Part No.	Part Name	Description
	PU21739	FG Board	

6.2.19 Drum motor board ass'y [2][8] . . . PQ30472A

Symbol No.	Part No.	Part Name	Description
	PU21998	Drum Motor Board	
CN 1	PU56258-10	Cap. Housing	

6.2.20 Mode control motor board [3][0]

Symbol No.	Part No.	Part Name	Description
	PU57725	Mode Control Motor Board	
C 1	QEN61HM-105	NP Cap	
C 2	QCF11HP-223	C Cap	
C 3	" -223	"	
CN 1	PU49215-102	Cap. Housing	
	PQ41430	Earth Lug	

6.2.21 Remote control board [4][0]

Symbol No.	Part No.	Part Name	Description
IC 1	M50115AP	Integrated Circuit	
Q 1	2SB822R,S	Transistor	
Q 2	2SD636R,S	"	
Q 3	DTC114F	D. Transistor	
D 1	SLR-932A	LED	
D 2	MA150	Diode	
D 3	"	"	
R 1	QRD161J-1R2	CR	
R 2	" -102	"	
R 3	" -470	"	
R 4	" -122	"	
R 5	" -103	"	
C 1	QER40JM-107	E Cap	
C 2	QCS11HJ-390	C Cap	
C 3	" -390	"	
CF 1	PU49487-2	Ceramic Filter	
SW 1	PU52930	Push Switch	CH DOWN
SW 2	"	"	CH UP
SW 3	"	"	V/T
SW 4	"	"	POWER
SW 5	"	"	PB
SW 6	"	"	PAUSE
SW 7	"	"	FF
SW 8	"	"	REW
SW 9	"	"	STOP
SW10	"	"	EJECT
SW11	"	"	REC

JVC COMPANY OF AMERICA

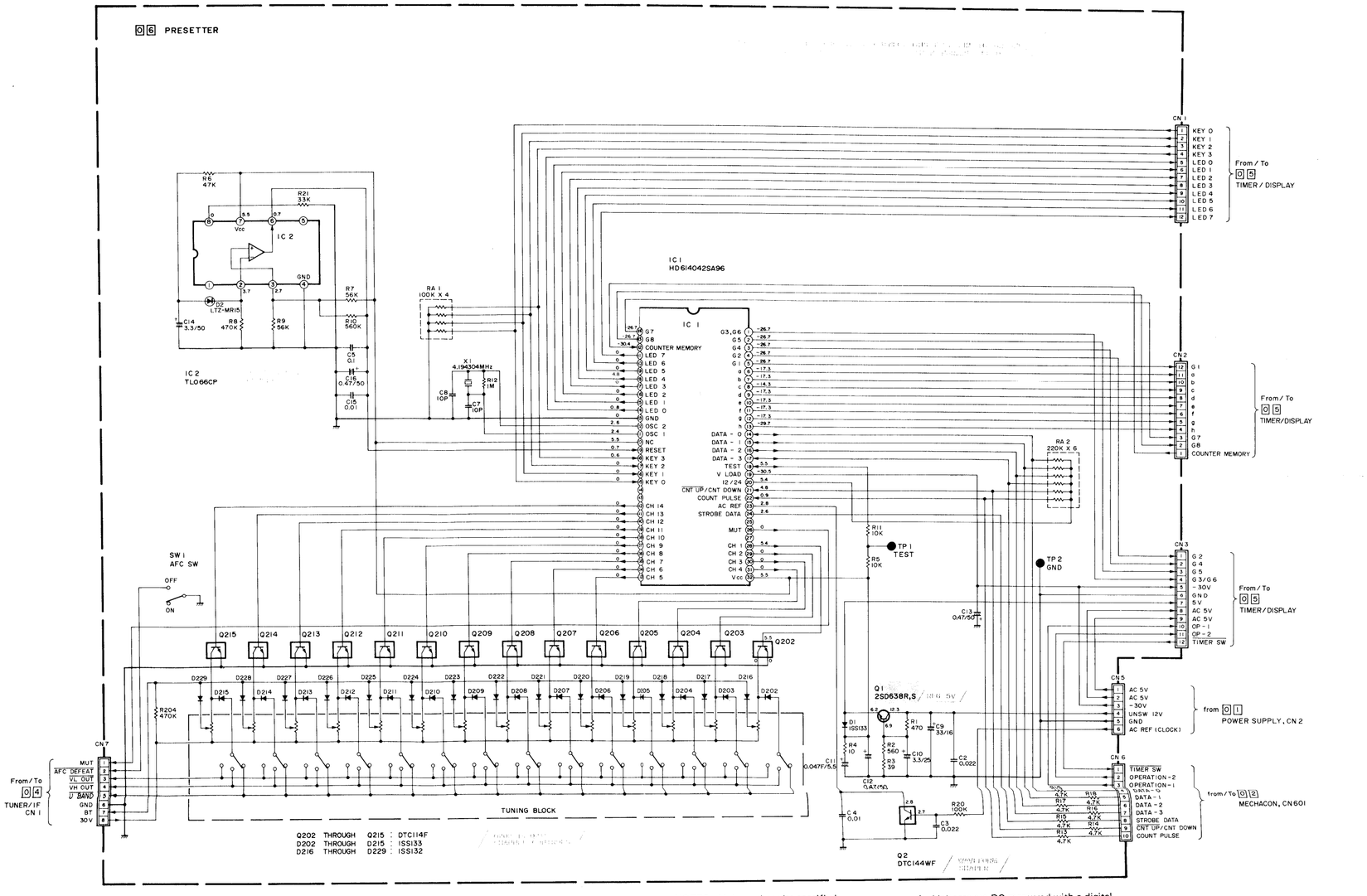
Head office (East Coast)	: 41 Slater Drive, Elmwood Park, New Jersey 07407	(201)794-3900
Midwest	: 2250 Lively Boulevard, Elk Grove, Illinois 60007	(312)364-0880
Southwest	: 407 Garden Oaks Blvd., Houston, Texas 77018	(713)694-0666
West Coast	: 1011 West Artesia Blvd., Compton, California 90220	(213)537-6020

JVC CANADA INC.

Head office : 21 Finchdene Square Scarborough, Ontario M1X 1A7 (416)293-1311

JVC

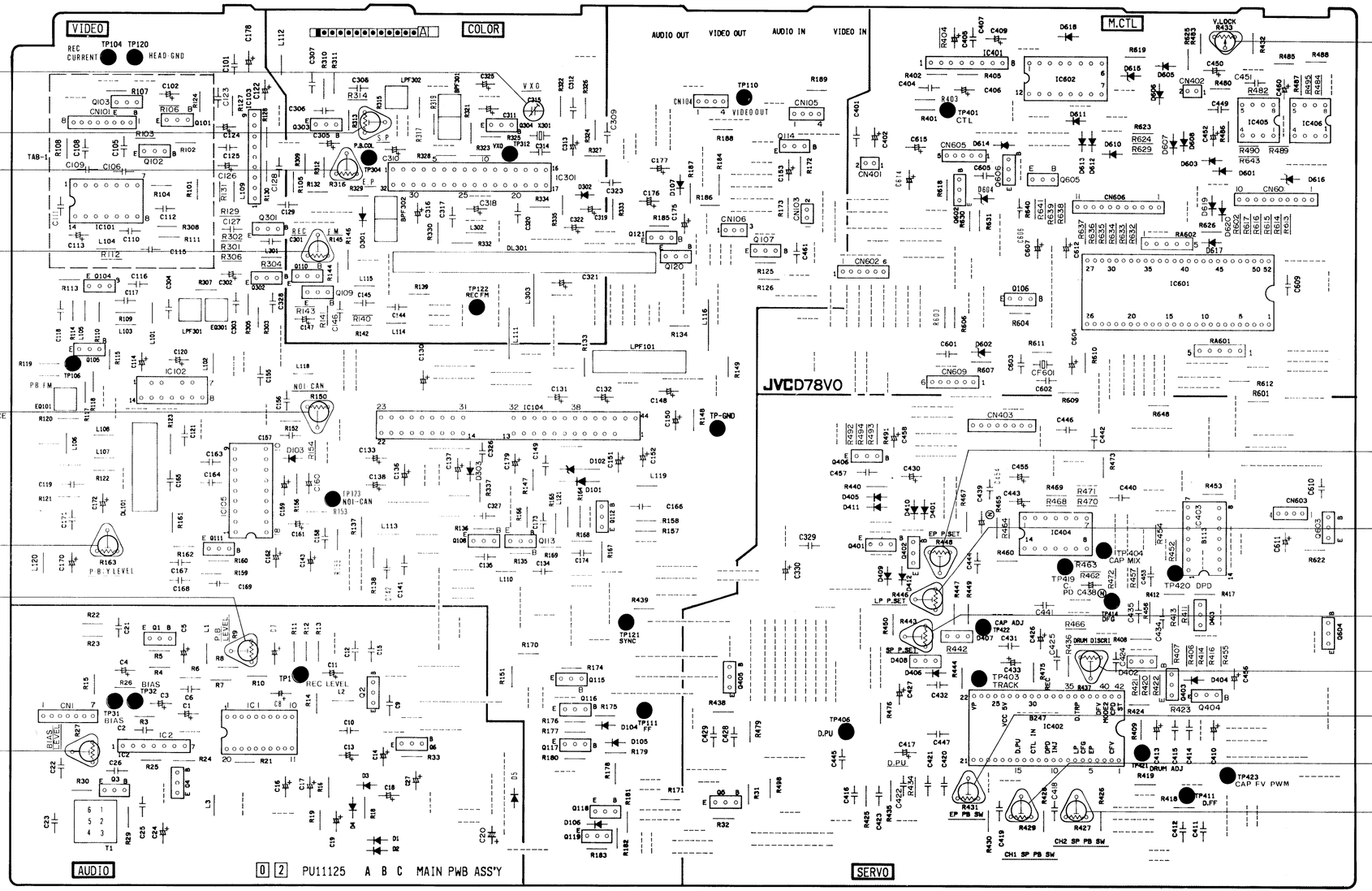
4.20 PRESETTER SCHEMATIC DIAGRAM (HR-D150U/UC)



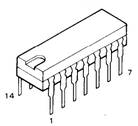
NOTES: Unless otherwise specified.

1. All resistance values are in ohms. (1/6 W).
2. All capacitance values are in μF.
3. All diodes are 1SS133.
4. Voltages are DC-measured with a digital voltmeter during stop mode.
5. Shaded ( ) parts are critical for safety. Replace only with speicfied part numbers.

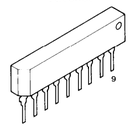
4.19 MAIN (VIDEO) CIRCUTI BOARD



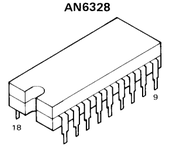
HA11782



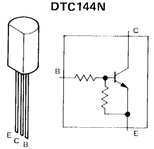
AN6392



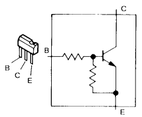
AN6328



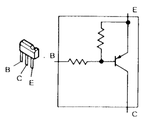
DTC144N



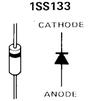
DTC124F



DTA124F

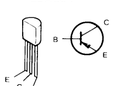


OA90
MA165
1SS133

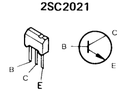


HZS3.3EB
RD2.7ES

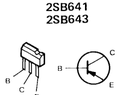
2SA564



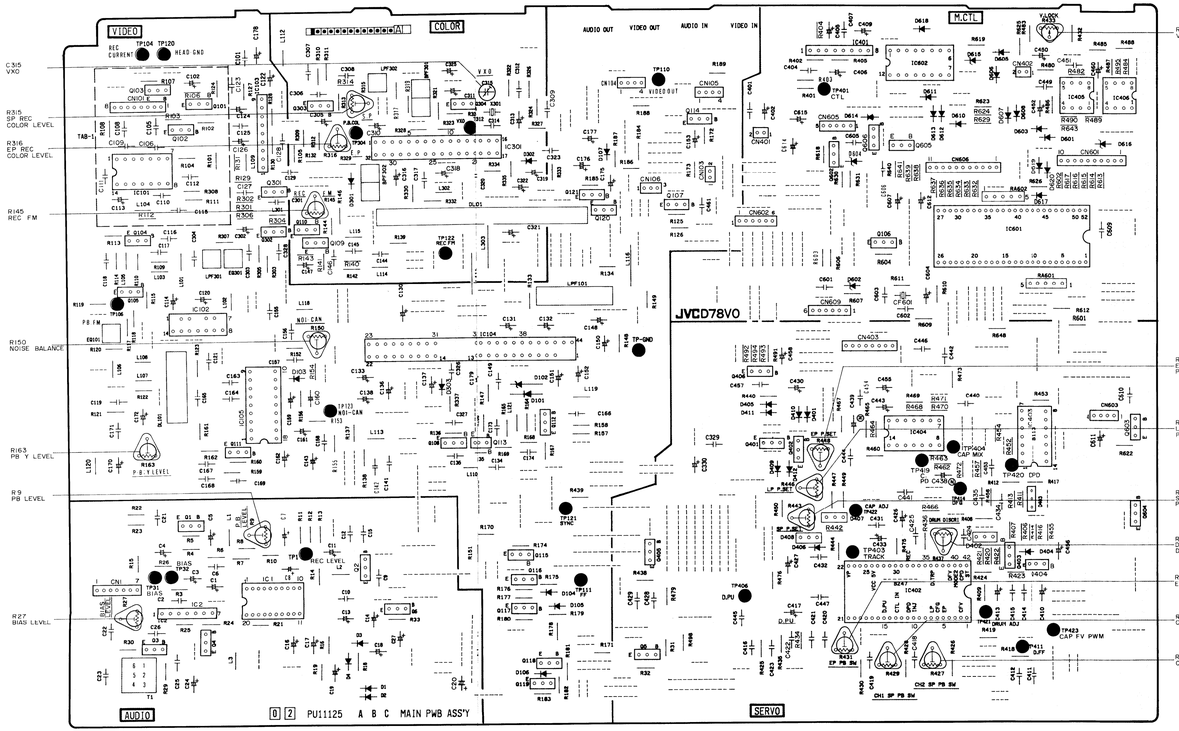
2SC2021



2SB641
2SB643



4.17 MAIN (SERVO) CIRCUIT BOARD

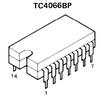


BA6305LN

HA11827NT

UPD4066BC

UPC324C TC4066BP

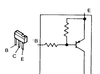


IF3702

M5223P

IR9393

DTA144WF



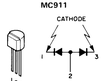
DTC144WF

2SD636

2SB641

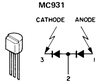
1SS133 MA165

MC911



MC921

MC931

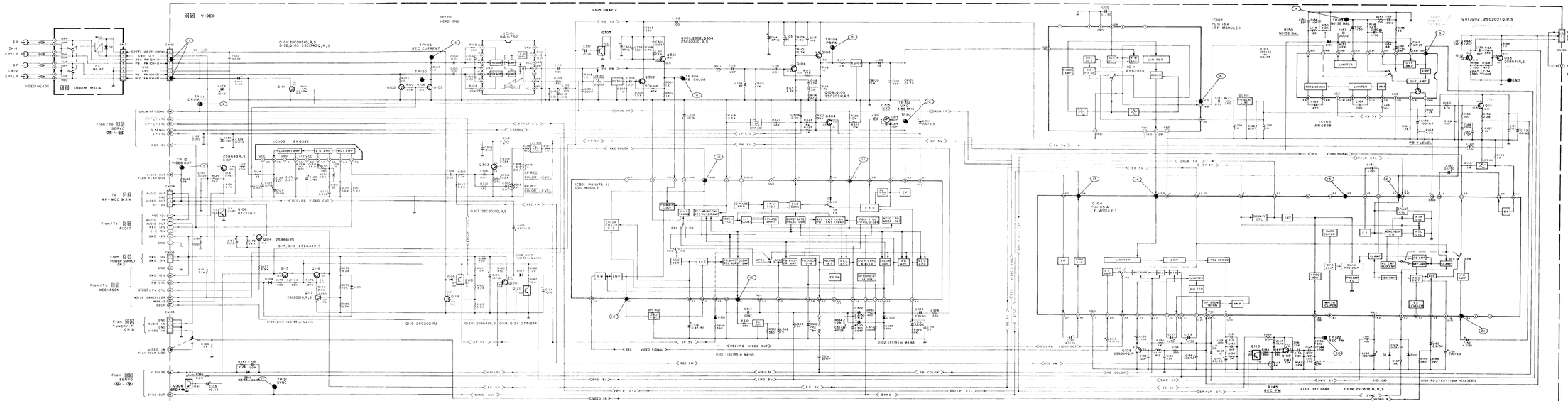


MAIN(SERVO)

VIDEO VIDEO

VIDEO VIDEO

4.18 VIDEO SCHEMATIC DIAGRAM



NOTES: Unless otherwise specified.

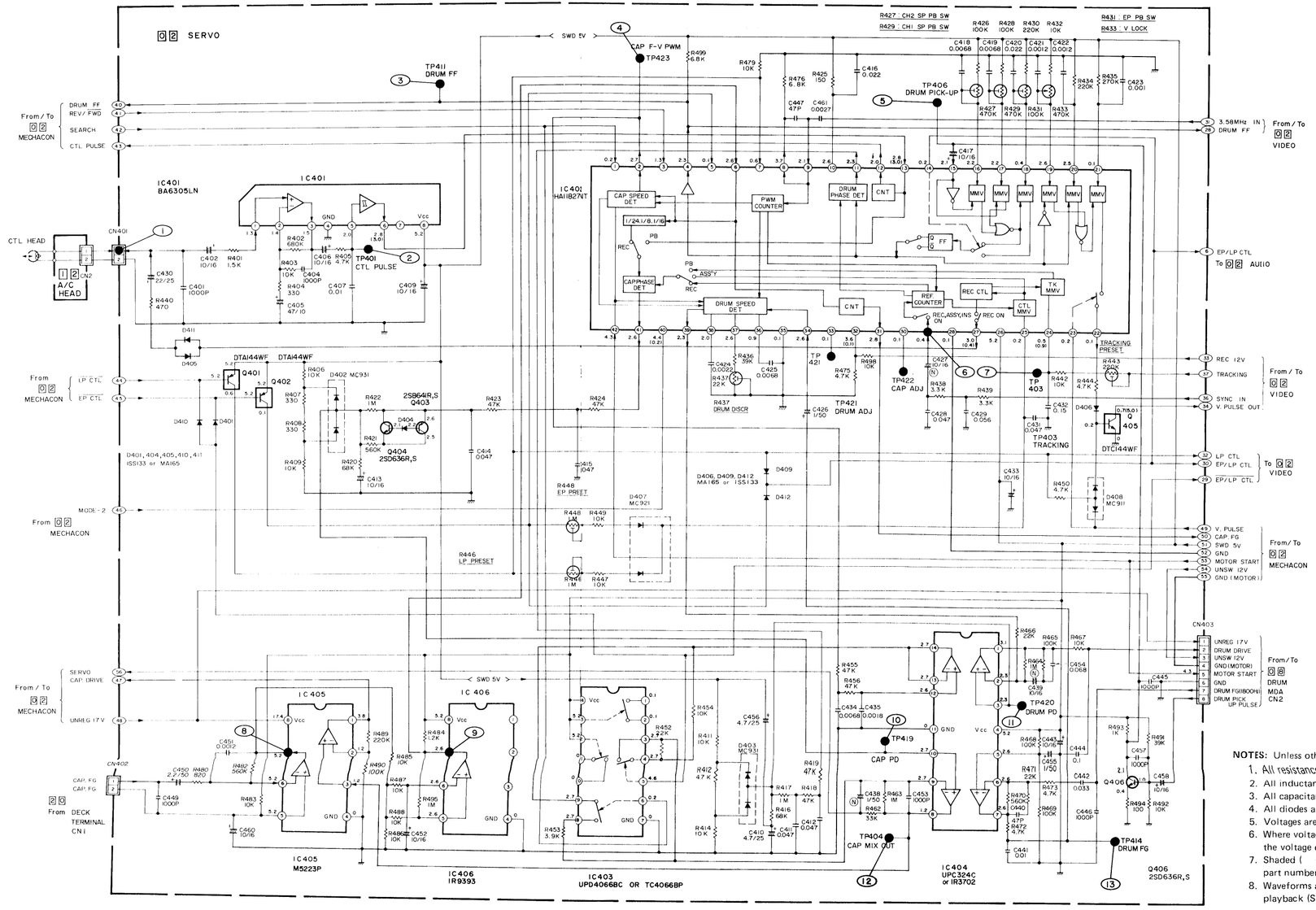
1. All resistance values are in ohms. (1/6 W).
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. All diodes are 1SS133 or MA165.
5. Voltages are DC-measured with a digital voltmeter during recording (SP mode).
6. Where voltage differs between recording (SP mode) and playback (SP mode), the voltage during playback is shown in parentheses.
7. Where voltage differs between recording (SP mode) and recording (EP mode), the voltage during recording (EP mode) is shown in rectangle.
8. Waveforms are measured with a color bar during recording (SP mode) and playback (SP mode) with alignment tape.

— Waveforms of video circuit —

1 CN101-1, 6 REC FM REC 4.7 Vp-p	2 TP111 DRUM FF 4.4 Vp-p	3 TP104 REC CURRENT REC 0.24 Vp-p
4 TP304 PB COLOR PB 0.11 Vp-p	5 TP106 PB FM PB 0.44 Vp-p	6 IC102-12 PB 0.34 Vp-p
7 TP123 NOISE BAL PB 0.8 Vp-p	8 IC105-18 PB 0.3 Vp-p	9 TP110 VIDEO OUT 0.92 Vp-p
10 IC301-5 REC COLOR REC 0.8 Vp-p	11 IC301-11 DRUM FF 2.2 Vp-p	12 TP312 VXO 0.6 Vp-p
13, 17 IC104-26 TP121 SYNC OUT 3.7 Vp-p	14 IC104-27 PB 0.34 Vp-p	15 IC104-35 REC 0.78 Vp-p
16 IC104-38 1.2 Vp-p	18 IC301-31 REC 0.15 Vp-p PB 0.32 Vp-p	19 IC301-26 1 Vp-p
20 TP122 REC FM REC 0.6 Vp-p	21 IC104-3 PB 0.22 Vp-p	

SERVO SERVO

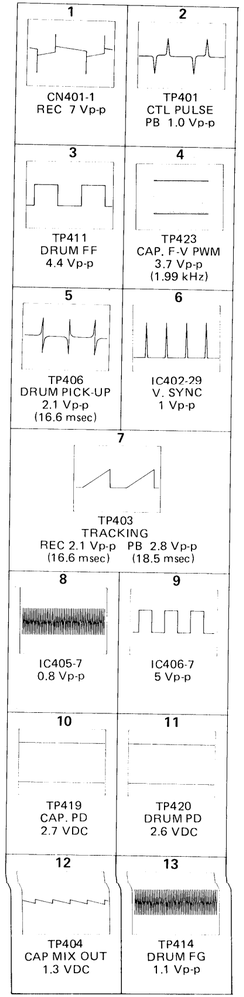
4.16 SERVO SCHEMATIC DIAGRAM



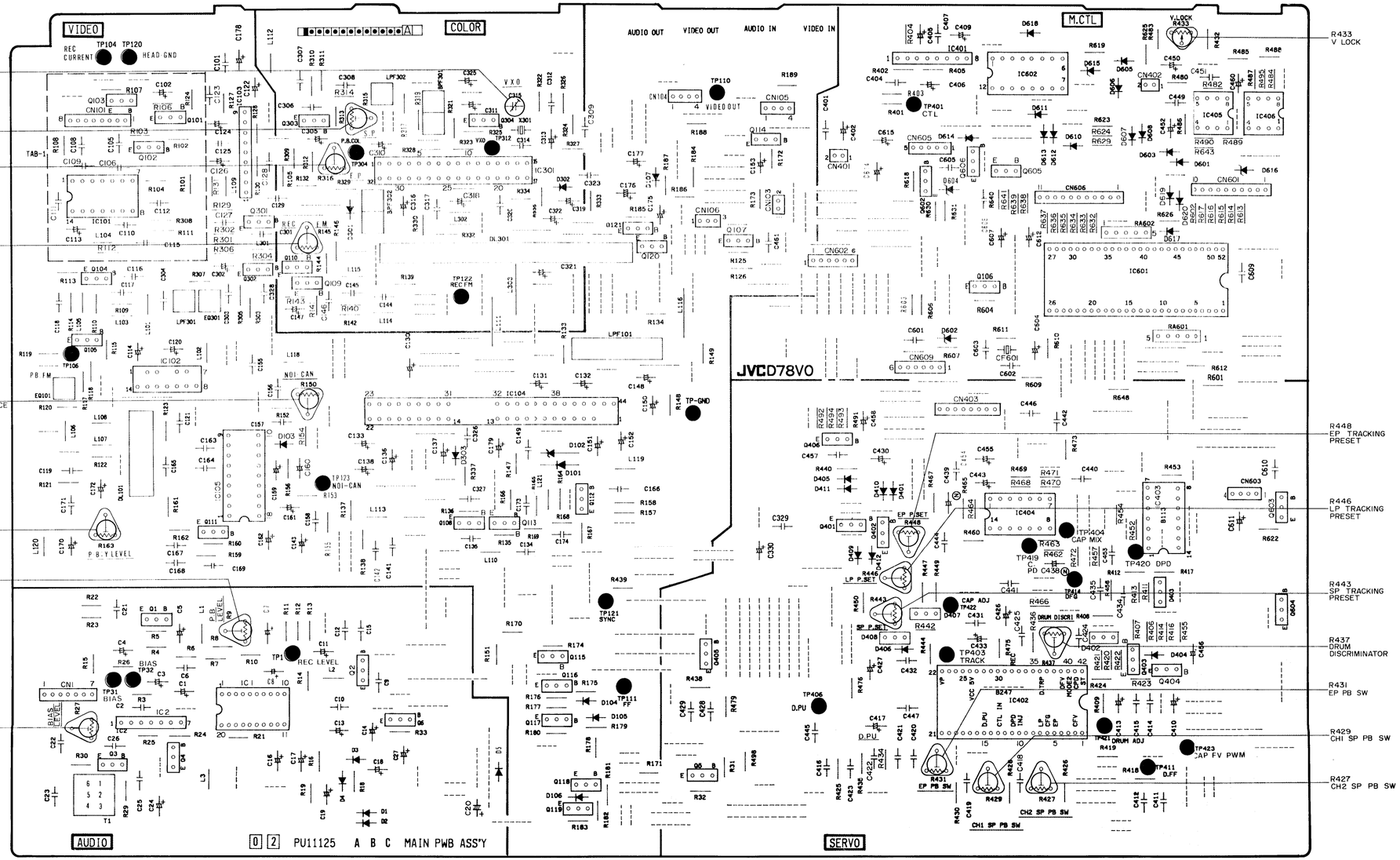
NOTES: Unless otherwise specified.

1. All resistance values are in ohms. (1/6 W).
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. All diodes are 1SS133 or MA165.
5. Voltages are DC-measured with a digital voltmeter during recording (SP mode).
6. Where voltage differs between recording (SP mode) and playback (SP mode), the voltage during playback is shown in parentheses.
7. Shaded ( ) parts are critical for safety. Replace only with specified part numbers.
8. Waveforms are measured with a color bar during recording (SP mode) and playback (SP mode) with alignment tape.

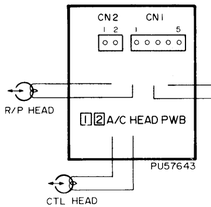
— Waveforms of servo circuit —



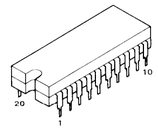
4.15 MAIN (AUDIO) CIRCUIT BOARD



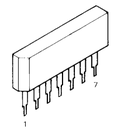
– A/CTL HEAD –



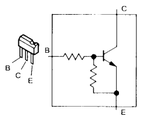
AN3991K



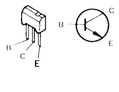
TA7361P



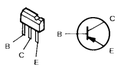
DTC124F



2SD636

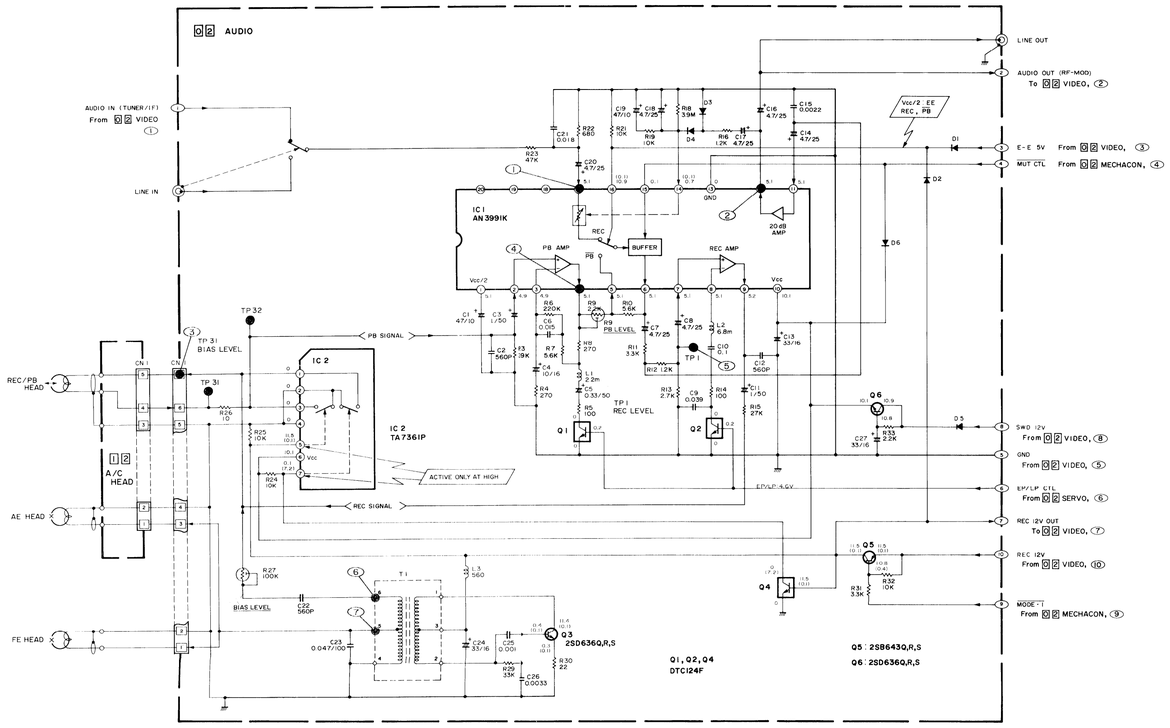


2SB643



MA165
1SS133

4.14 AUDIO SCHEMATIC DIAGRAM



AUDIO AUDIO

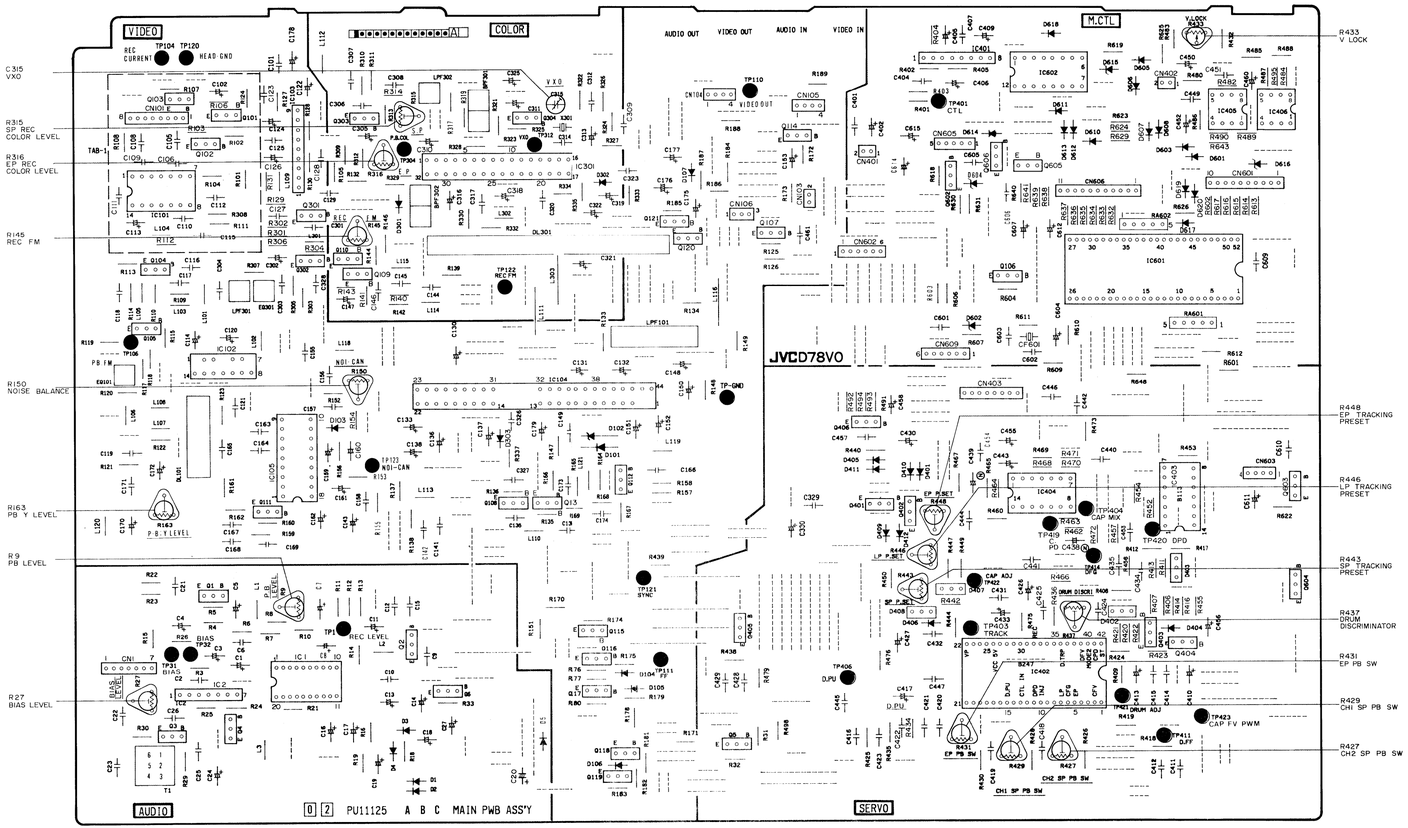
— Waveforms fo audio circuit —

1	2
IC1-17 40 mVp-p REC	IC1-12 REC 1.2 Vp-p PB 0.8 Vp-p
3	4
CN1-7 REC 30 Vp-p	IC1-4 PB 50 mVp-p
5	6
TP1 REC 85 mVp-p	T1-6 REC 84 Vp-p
7	
T1-5 REC 30 Vp-p	

NOTES: Unless otherwise specified.

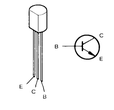
1. All resistance values are in ohms. (1/6 W).
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. Voltages are DC-measured with a digital voltmeter during recording (SP mode).
5. Where voltage differs between recording (SP mode) and playback (SP mode), the voltage during playback is shown in parentheses.
6. Shaded ( ) parts are critical for safety. Replace only with specified part numbers.
7. All diodes are MA165 or 1SS133.
8. Waveforms are measured with a sinewave (−8 dBs/1 kHz) during recording (SP mode) and playback (SP mode) with alignment tape.

4.13 MAIN (MECHACON) CIRCUIT BOARD

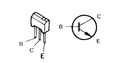


MAIN(MECHACON) MAIN(MECHACON)

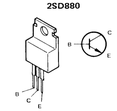
2SC3243



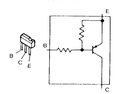
2SD637



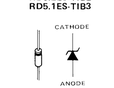
2SD880



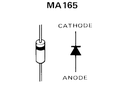
DTA124F



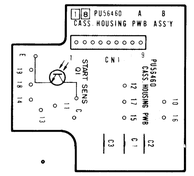
RD7.5ES-T1B2
RD6.2ES-T1B1
RD8.2ES-T1B2
RD5.1ES-T1B3



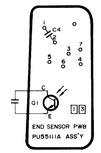
MA165



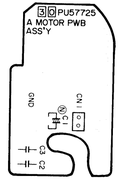
– CASSETTE HOUSING –



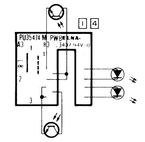
– END SENSOR –



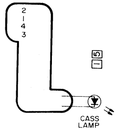
– MODE CONTROL MOTOR –



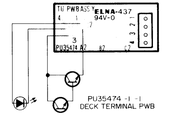
– LOADING SENSOR –



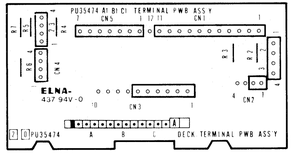
– CASSETTE LED –



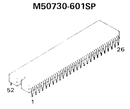
– TAKE UP SENSOR –



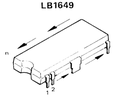
– TERMIANL –



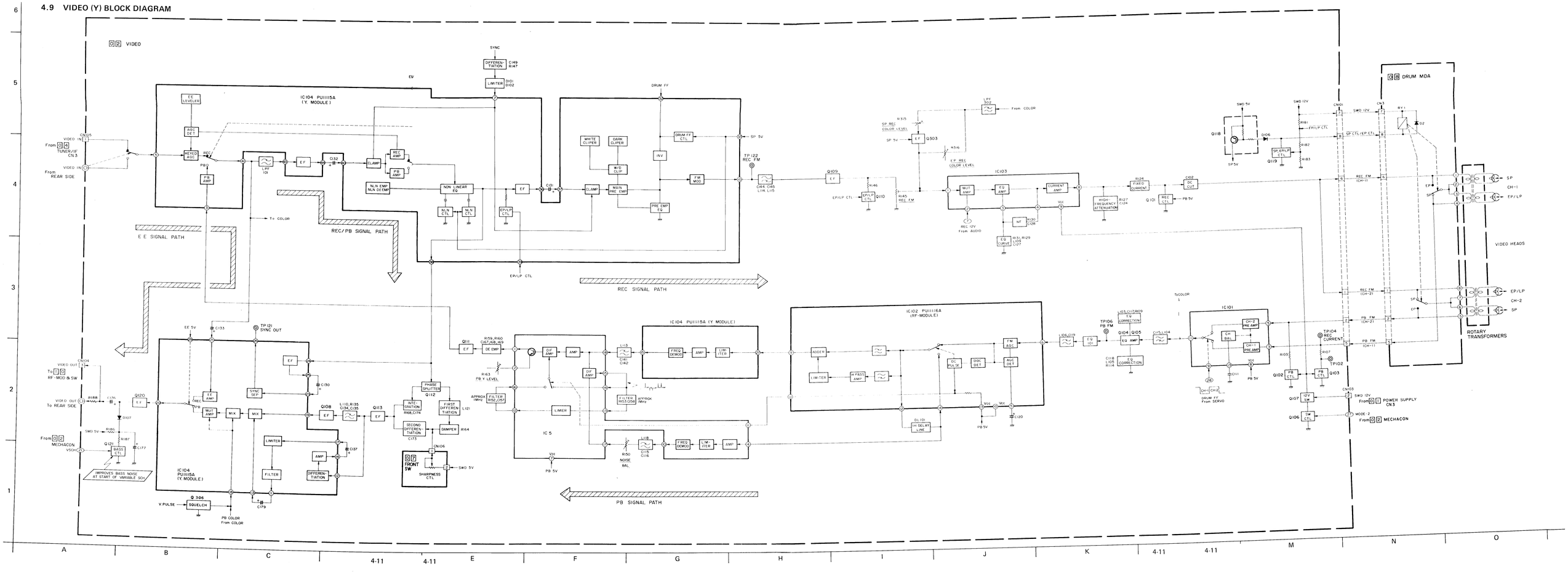
M50730-601SP



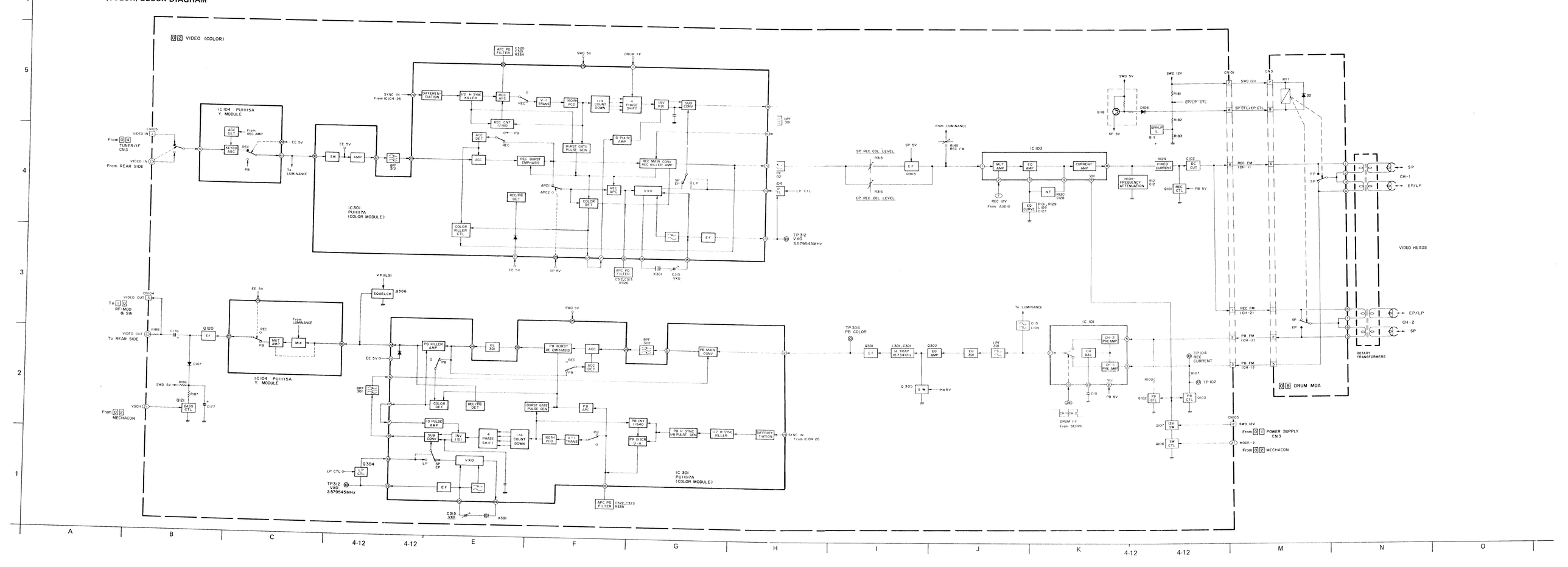
LB1649



4.9 VIDEO (Y) BLOCK DIAGRAM



4-12 BLOCK DIAGRAM



4-12 4-12 4-12 4-12